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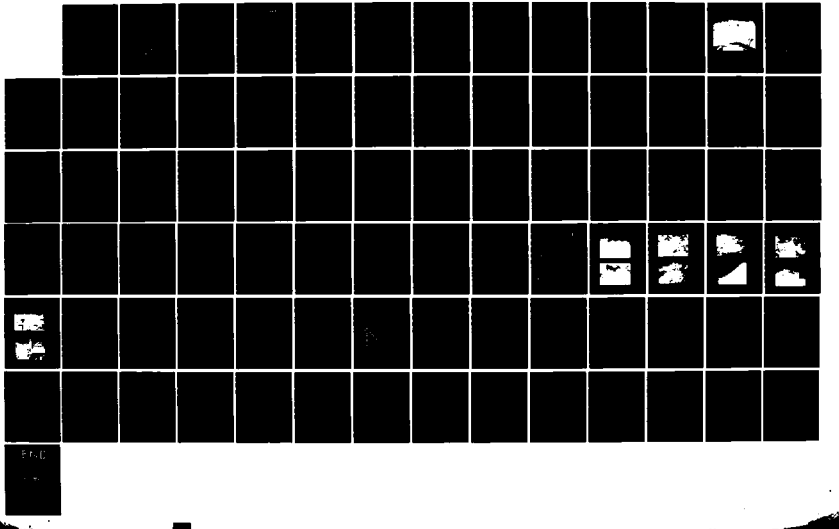
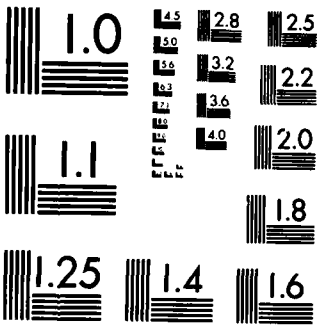


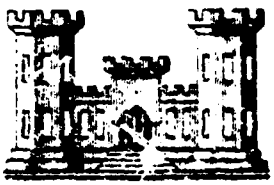


BLACKSTONE RIVER BASIN
AUBURN, MASSACHUSETTS

PONDVILLE DAM

MA. 00197

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JANUARY 1981

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS
DRAFT REPORT REVIEW COMMENTS

Pondville Dam DAM, IDENTITY NO. MA 00197

GEOTECHNICAL ENGINEERING BRANCH

Page No.	Comments
	(will state that u/s slope could not be determined due to heavy brush growth
p.1 R1.2b	State limits of variable u/s slope
p.1 R1.3b.1	Clarify invert el. of 10" dia. steel pipe through spillway, ~~upstream~~ or downstream inv. el.? Same comment on p.6 R1.3j.1
p.5 R1.3g.5	State limits of variable u/s slope
p.8 R3.1b.	State if the three pipes protruding from the downstream wall are yoked. If so, where? If not, where are they plugged, u/s or d/s? What is the quantity & clarity of the seepage? Was seepage observed in the void? Will clarify
p.16 R7.2(1)	Typo "the"
p.17 R7.2(4)	Typo "growth"
p.17 R7.2(4)	Include trees along the embankment & within 10 ft. of the toe of the rubble walls. ~~Eliminate removal of brush.~~ Add backfill of root systems w/ appropriate material
p.17 R7.3(1)	~~Specify removal of small trees & brush only~~ Limits R7.3a(1)
	Discuss cover color, change to yellow
p.21	Provide more detail on plan
p.17 R7.2	Add recommendation to investigate seepage at pipes.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00197	2. GOVT ACCESSION NO. A154903 / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Pondville Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS	5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	8. CONTRACT OR GRANT NUMBER(s)
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Blackstone River BAsin
Auburn, Massachusetts
Ramshorn Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

-The dam is about 141 ft. long and 12.5 ft. high. The dam was judged to be in poor condition. It is small in size and has a hazard potential of high. A breach of the dam would cause minor flooding of several commercial buildings, a post office building, several roadways and a railroad.

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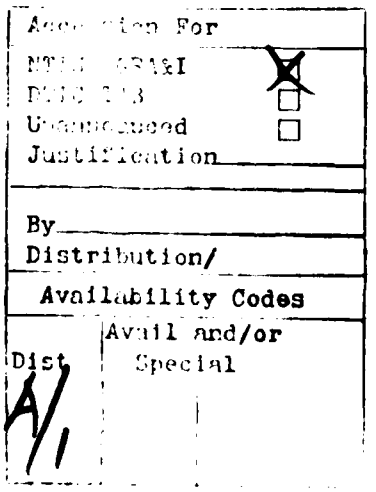
PONDVILLE POND DAM

MA 00197

BLACKSTONE RIVER BASIN
AUBURN, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	MA 00197
Name of Dam:	Pondville Pond Dam
Town:	Auburn
County and State:	Worcester County, Massachusetts
Stream:	Ramshorn Brook
Date of Inspection:	24 October 1980

BRIEF ASSESSMENT

Pondville Pond Dam is a rubble masonry wall dam with an upstream earth embankment constructed around 1875 to supply the water needs of a mill located on the right abutment. The dam is about 141 ft. long and 12.5 ft. high. The downstream wall is continuous with an old foundation wall for the former mill site which extends to the right of the dam. The spillway for the facility is located right of the dam's left abutment. It is a rubble masonry gravity structure founded on bedrock. The spillway crest length is 47 ft. and the training walls, which are of rubble masonry construction extend 2 ft. upward to the top of the dam. There is a 10 in. dia. steel pipe projecting through the spillway face which may have at one time served as a low level outlet for the dam. At the present time the low level outlet is not in an operative condition. The mill has been razed and the only purpose of the dam at the present time is to impound water for recreational uses.

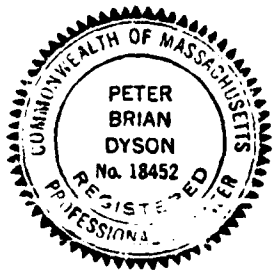
The pond is about 6,700 ft. long and the surface area of the pond at spillway crest level is about 37 acres. A highway embankment supporting U.S. Route 20 crosses the pond about 150 ft. upstream of the dam. The low point in the roadway is about 11.5 ft. above the top of the dam and the surface area of the pond between the dam and the highway embankment is about 1 acre. The drainage area above the dam is about 7.55 sq. mi. (4,832 acres), the maximum storage to top of dam is about 282 acre-ft. Based on storage capacity the size is small. A breach of the dam would cause minor flooding of several commercial buildings, a post office building, several roadways and a railroad, which potentially could cause appreciable economic losses; therefore, the dam has been classified as having a significant hazard potential. Based upon the guidelines, the recommended test flood ranges from a 100 year flood to a ½ PMF. A test flood equal to a ½PMF was selected.

The best flood inflow is 3,800 cfs; the routed test flood outflow of 1,500 cfs would overtop the dam by 1.4 ft. The spillway can pass about 425 cfs or about 28 percent of the routed test flood outflow without overtopping the dam.

The dam was judged to be in poor physical condition. A large section of the embankment has eroded away near the right training wall of the spillway. There is a void at the base of the same wall and seepage was noted coming through the void. Seepage was also noted at the base of the old mill foundation wall. Tree and brush growth is abundant on the embankment and just upstream of the crest of the spillway. The left training wall of the spillway has collapsed. Three old pipes project from the downstream face of the dam and two are leaking water. There is no operational low level outlet for the dam.

Within one year after receipt of this Phase I Inspection Report, with the exception of the investigation of the voids and seepage in the vicinity of the right training wall of the spillway which should be performed upon receipt of this report, the owner, the Town of Auburn should retain the services of a qualified registered professional engineer to perform the following services: (1) perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and means to increase project discharge capacity; (2) investigate the reasons for the void and loss of the embankment just right of the right training wall of the spillway, and the void in the spillway training wall and the seepage emitting through it; (3) investigate the need for and means to provide adequate drawdown capacity; (4) prepare a plan and supervise removal of trees (greater than 4 in.) and heavy brush growth including their root systems from the upstream side of the spillway; (5) investigate the structural adequacy of the rubble masonry walls; (6) investigate the need for riprap on the upstream slope of the embankment; and (7) investigate the need to permanently plug the three pipes on their upstream ends.

The owner should also implement the following operating and maintenance measures: (1) remove trees (less than 4 in.) brush growth including their root systems on the embankment and at the toe of the dam to a distance of 10 ft. from the face of the rubble wall; (2) monitor seepage issuing through the rubble masonry wall in the area of the old mill site and through two leaking pipes protruding through the face of the dam to the right of the spillway on a six month basis, to ascertain any changes in clarity or quanity of flow; (3) repair the training wall on the left side of the spillway; (4) develop a formal surveillance and downstream emergency warning plan including round-the-clock monitoring during periods of heavy precipitation; (5) institute procedures for an annual technical inspection of the dam and its appurtenant structures; and (6) implement a regular periodic maintenance program for the dam.



Peter B. Dyson
Project Manager

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

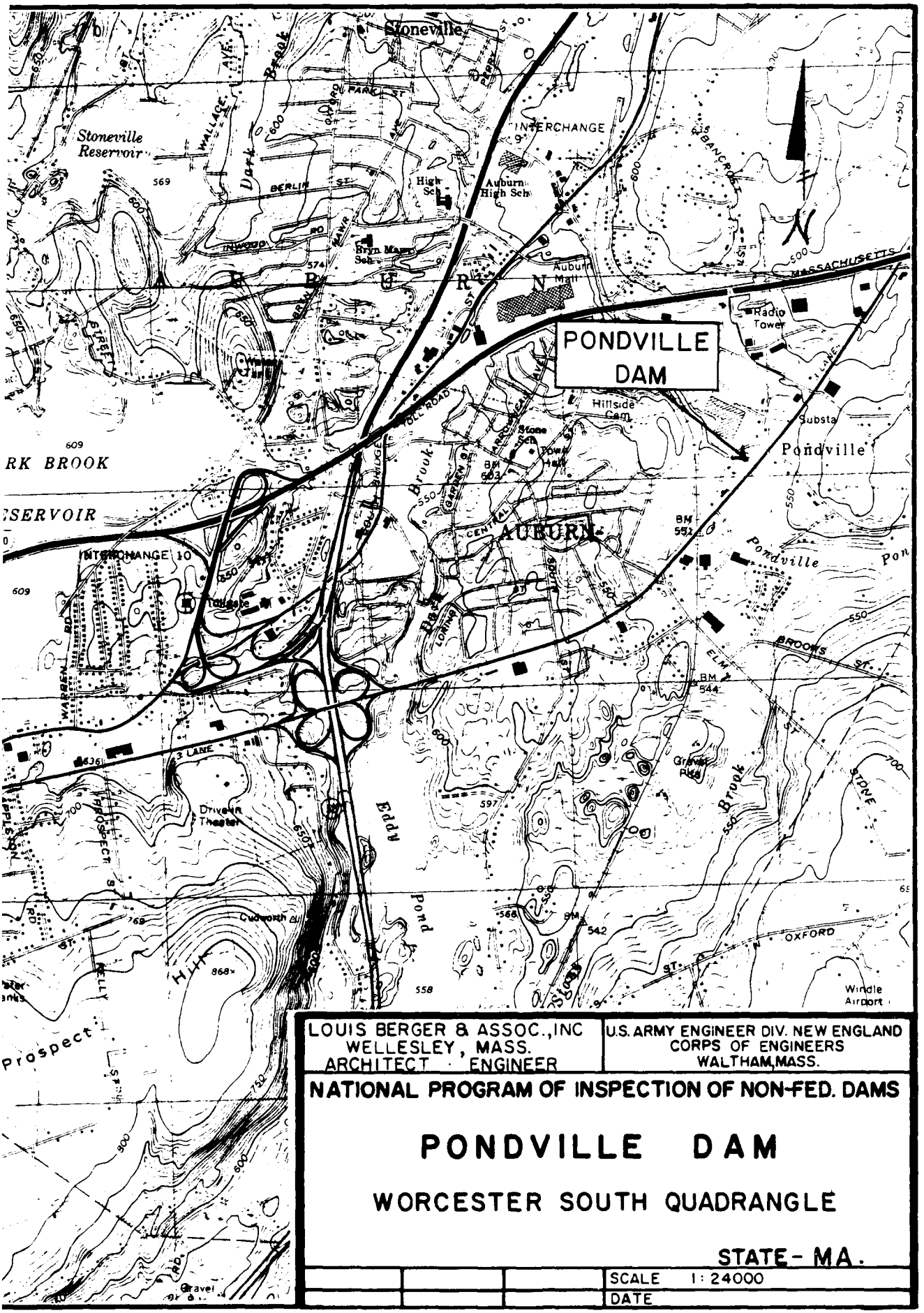
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

OVERVIEW PHOTO

(Photo Taken 2 March 1981)



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NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PONDVILLE DAM

WORCESTER SOUTH QUADRANGLE

STATE - MA.

			SCALE 1:24000
			DATE

5.5 Dam Failure Analysis

A breach owing to structural failure of the dam is a possibility. Because of the sudden drawdown that would occur at the U.S. Route 20 culvert if the dam failed, it was assumed in this analysis that the Route 20 roadway embankment would simultaneously fail yielding a discharge equal to the dam breach discharge. For the analysis the breach was assumed to occur with the water surface level at top of dam. With a breach width of 40 percent of the dam length at midheight equal to 56 ft., an outflow of about 4,600 cfs would be realized, which includes about 250 cfs from the intact portion of the spillway, (see Sheets D-18 thru D-24, Appendix D).

A breach failure of Pondville Pond Dam would release water down Ramshorn Brook to the Massachusetts Turnpike located about 3,800 ft. below the dam, and thence through a highly developed area of Auburn for a distance of about 3,200 ft. and on into the backwaters of Kettle Brook. It is estimated a local road located a short distance below the dam will be flooded and that all other flooding having a damaging effect will be confined to the developed area between the Mass. Turnpike and Auburn St. At the Mass. Turnpike it is estimated the breach discharge will be reduced to about 3,400 cfs and two local roadways and a railroad track passing under the turnpike will be flooded to a depth of less than 1 ft. A dam is located on the brook just downstream of the Auburn Mall. It is estimated this dam will be overtopped by about 1.5 ft., two houses upstream of the dam will be flooded and a local roadway and State Route 12 will be flooded. All flooding in this vicinity will be to depths of 1 ft. or less. At Auburn St. it is estimated the street will be inundated and as many as seven commercial buildings and a post office building would be subjected to flooding to depths of 1 ft. or less. Beyond Auburn St. the flood waters will enter the backwaters of Kettle Brook where the flood surge should be significantly reduced.

In summary, for the assumed breach conditions, two houses, seven commercial buildings, a post office building, four local roadways, a railroad and State Route 12 would be subject to some flood damage. It is estimated no significant flooding would occur for the prefailure conditions. In the event of the assumed failure there is a potential for appreciable economic losses. Therefore, in accordance with the Recommended Guidelines for Safety Inspection of Dams the dam has been classified as having a significant hazard potential. Sheet D-25, Appendix D showns the area of potential flooding.

Precipitation data was obtained from Hydrometeorolgical Report NO. 51 which for this area of Massachusetts is about 25 in. of 6 hour maximum rainfall over a 10 square mile area. This value was then reduced by 20 percent to allow for basin size, shape and fit factors and further reduced by 0.4 in. for infiltration losses. The six hour rainfall was distributed into one hour incremental periods as suggested in the Corps of Engineers Publication EC 1110-2-1411.

A triangular incremental unitgraph was constructed to find the inflow into Ramshorn Pond and then routed graphically through Ramshorn Pond Dam to find the outflow contributing to the remaining drainage area between Ramshorn Pond and Pondville Pond Dam, (see sheets D-8 thru D-13, appendix D).

For the subarea below Ramshorn Pond a triangular incremental unitgraph was assumed for the inflow hydrograph and the Ramshorn Pond outflow hydrograph was added indicating a ½PMF inflow at Pondville Pond of 3,800 cfs, (see Sheets D-14 thru D-16, Appendix D).

Discharge tables and curves for the dam and the U.S.Route 20 culvert are shown on Sheets D-4 thru D-7, Appendix D. For determining surface areas and surcharge capacities, planimetered areas were taken from contours delineated on 1:25,000 U.S.G.S. Sheets.

A graphical flood routing was performed for the test flood through the U.S.Route 20 culvert to determine the outflow from Pondville Pond that would pass over Pondville Pond Dam. Because of the low volume of surcharge space between U.S. Route 20 and the dam, the discharge over the dam was assumed equal to the routed test flood outflow from the culvert. The routing is shown on Sheet D-17, Appendix D and summarized as follows:

Flood Magnitude	Test Flood Inflow (cfs)	Maximum Res. El. (ft. NGVD)	Max. Head Over Crest of Dam (ft.)	Routed Test Flood Outflow (cfs)
½ PMF	3,800	*518.4 **527.5	1.4	1,500

* Upstream of dam
** Upstream of U.S. Route 20 - Top of roadway elevation 528.5

From the above table, it can be seen that the project will not pass the routed test flood outflow without overtopping the dam by about 1.4 ft. The project can handle about 28 percent of the routed test flood outflow without overtopping the dam.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General.

Pondville Pond Dam is a rubble masonry wall dam with an upstream earthfill. A highway embankment supporting U.S. Route 20 crosses Pondville Pond about 150 ft. upstream of the dam. Water passes through the highway embankment via a concrete box culvert which is about 13 ft. wide and 6.5 ft. high. Practically all of Pondville Pond lies upstream of U.S. Route 20. The surface area of the Pond between the dam and the highway embankment is about 1 acre and the remainder of the pond has a surface area of about 45 acres. The dam impounds a normal storage of about 170 acre-ft., with provisions for an additional 112 acre-ft. in its surcharge space to top of dam. It is basically a low surcharge-low spillage facility now used to impound water for recreational purposes. At times of extreme high flows a significant head differential builds up across the U.S. Route 20 embankment as flows are restricted by the roadway culvert. With the pond water surface at the top of the dam the spillway discharges about 425 cfs.

The general topographic characteristics of the 7.55 sq. mi. drainage area is best described as rolling terrain which rises from elevation 515 ft. at spillway crest level to elevation 830. Ramshorn Pond is located in the upper reaches of the watershed and has a significant attenuating effect on runoff from the 2.4 sq. mi. drainage area above Ramshorn Pond.

5.2 Design Data

No hydrologic computations or hydraulic data has been recovered for the dam.

5.3 Experience Data

No records are available in regard to past operation of the reservoir, nor of surcharge encroachments and flows through the spillway. The maximum past outflows are unknown.

5.4 Test Flood Analysis

Hydrologic characteristics of Pondville Pond Dam and drainage area were evaluated in accordance with criteria given in Recommended Guidelines for Safety Inspection of Dams. As indicated in Section 1.2, paragraphs c and d, Pondville Pond Dam is classified as small in size and has a significant hazard potential. The recommended test flood for hydraulic evaluation of such a dam ranges from a 100 year flood to a one half probable maximum flood, (½ PMF). Because of the highly developed area downstream of the dam a test flood equal to a ½ PMF was selected.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operation Procedures

a. General. The dam is owned and operated by the Town of Auburn, Massachusetts. The dam was once used to impound water for a mill which was located at the site. Sometime in the past the mill was razed and there are no longer any operational devices at the dam. It was reported the dam is visited about once per month by town personnel and more often during periods of heavy rain.

b. Description of any Warning System in Effect. No warning system is in effect at Pondville Pond.

4.2 Maintenance Procedures

a. General. There is no documented regular periodic maintenance program in effect at Pondville Pond Dam, nor does the dam show any signs of maintenance during recent years. There are, however, several items which require periodic maintenance, such as: the removal of brush and tree growth from the embankment; the repair of the spillway taining walls and the downstream retaining wall; keeping the spillway clear of debris; surveillance of the downstream wall regarding seeps; and maintenance of the low level outlet facility.

b. Operating Facilities. The only facility for the dam is a hand operated control which regulates the flows through the low level outlet. This facility has not been maintained in recent years and at the present time is not in a working condition.

4.3 Evaluation

Overall maintenance of the dam is poor. Specific maintenance items are evaluated as follows: There is abundant brush and tree growth on the embankment and just upstream of the spillway; much of the growth has matured and there is now a large tree growing upstream of the spillway; a substantial section of the embankment has eroded away and has not been repaired; the spillway training walls are in need of repair; and no maintenance has been performed on the low level outlet. A regular periodic maintenance program should be implemented. The owner should also establish a formal downstream warning system for the dam in the event of an emergency.

3.2 Evaluation

The visual inspection adequately revealed characteristics of the dam as they may relate to its stability and integrity. The dam and appurtenant works were judged to be in poor physical condition. One seep was found at the toe of the downstream wall. Brush and tree growth was abundant on both the earth embankment and just upstream of the crest of the spillway. A substantial section of the earth embankment had eroded away and there was no operational low level outlet for the dam. There is no regular periodic maintenance program for the dam. Two of the abandoned pipes on the right side of the dam were leaking.

c. Appurtenant Structures. The spillway for the facility is located just right of the left abutment. It is an uncemented rubble masonry gravity structure founded on bedrock. It has a crest length of 47 ft. and the training walls for the spillway extend 2 ft. upward to the top of the dam. Photo no. 7 is a view of the right side of the spillway taken from the downstream side. A plunge pool formed by ledge outcrops can be seen in the foreground of the photo. The rim of the plunge pool is about 7 ft. below the crest of the spillway and 3.5 ft. above the downstream streambed. There is abundant tree and brush growth on the upstream side of the spillway, which partially blocks the approach to the spillway. Photo no. 8 is a view of the spillway taken from the upstream side. The large tree and brush in the center of the picture are located just upstream of the spillway. There are rubble masonry training walls to the spillway which extend downstream of the crest about 14 ft. The left training wall of the spillway abuts the left abutment of the dam and it is in poor condition, part of the wall having collapsed. The right training wall of the spillway, which also supports the left end of the earth embankment, is in poor condition because of the void at its base as previously mentioned under section 3.1 b above.

A 10 in. steel pipe projects through the face of the spillway as shown in photo no. 1 and is supported on the downstream end by a ledge outcrop. The pipe is in poor condition and was discharging water on the day of the inspection. A stem which leads to the control for the pipe was located upstream of the spillway but the mechanism is not in a working condition. Even if this conduit was in good operative condition it has a low discharge capacity and the invert of the pipe is above the toe of the dam, thereby limiting its capability as a means to safely drain the pond in the event of an emergency.

d. Reservoir Area. About 150 ft. upstream of the dam a highway embankment supporting U.S. Route 20 crosses Pondville Pond. Water is conveyed through the embankment via a 13 ft. wide by 6.5 ft. high concrete box culvert. The low point of the highway embankment is about 11.5 ft. above the top of the dam. The surface area upstream of the highway embankment is about 45 acres and the surface area downstream is about 1 acre. The shore lines of the pond are moderately sloped and there was no evidence of sloughing of the slopes upstream of the dam on both the right and left abutments.

e. Downstream Channel. As noted above, the spillway discharges into a plunge pool formed by bedrock. Below the plunge pool the discharge channel is formed by rubble masonry walls which are in fair condition. About 200 ft. below the dam Ramshorn Brook passes under a local roadway and then follows a narrow river channel with high and steep sides until passing under the Penn Central Railroad. Beyond the railroad the brook enters the backwaters of a small dam which is located in a highly developed area of Auburn. Beyond the dam the brook passes under State Route 12, through the playgrounds of Auburn High School and thence under Auburn St. to the backwaters of Kettle Brook. Between the Penn Central Railroad and Kettle Brook the brook passes through four roadway culvert and/or bridge structures, all of which are relatively large.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General. The visual inspection of Pondville Pond Dam took place on 24 October 1980. At that time the water level in the pond was just about level with the crest of the spillway. A small amount of water was discharging over the spillway at low points along the crest and water was also discharging from a 10 in. dia. pipe that protrudes through the face of the spillway. A substantial section of the embankment has eroded away. Seepage was noted at the downstream side of dam. Brush and tree growth is abundant on the embankment and just upstream of the crest of the spillway and there is no operative low level outlet for the facility. The general physical condition of the dam was judged to be poor.

b. Dam. Pondville Pond Dam is an uncemented rubble masonry dam with an upstream earthfill. The crest length of the dam is about 141 ft. and the height is about 12.5 ft. The top width of the dam varies, but averages about 16 ft. The downstream rubble masonry wall has a vertical face and the upstream slope is unknown. The downstream wall is continuous with an old foundation wall for a mill that once was located on the right abutment. The embankment section and the right abutment is heavily grown over with trees and brush, to the point where the abutment and a portion of the dam is totally obscured (see photo no. 1, appendix C).

Three pipes protrude at different locations near the toe of the downstream wall. Two of the pipes are about 6 in. in diameter and both are leaking a small amount of clear water as shown in photo nos. 2 and 3. An estimate of the quantity of flow was not made. The third pipe is a 3 ft. dia. steel pipe that is severly corroded (See Appendix C, Photo No. 9). It could not be determined if the pipes are gated or plugged on the upstream end. It is believed they once served the mill which was located at the dam site, but now serve no useful purpose.

A section on the left side of the embankment adjacent to the right training wall of the spillway has eroded away severly, resulting in a void approximately 6 ft. wide by 10 ft. long, as shown in photo nos 4 and 5. The bottom of the void in the embankment extends downward to the base of the right training wall of the spillway where there is a void in the training wall as shown in photo nos 6 & 10. Clear seepage was noted coming through the dam below this void. It was not possible to make an estimate of the quantity of flow. This seciton of the dam is in extremely poor condition, as a significant section of the embankment upstream of the wall has eroded away and the remaining portion is "hanging by a thread". Clear seepage was observed in the void but could not be estimated because of heavy brush growth.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No data on the design of the dam or appurtenances has been recovered. In the course of the inspection, measurements were taken and a sketch plan and profile layout of Pondville Pond Dam and spillway has been prepared. This plan is included in Appendix B.

2.2 Construction Data

No records or correspondence have been found regarding construction data.

2.3 Operation Data

No engineering operational data were disclosed.

2.4 Evaluation of Data

a. Availability. There was no engineering data available. The basis of the evaluation presented in this report is principally the visual observations of the inspection team.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Validity. Not applicable.

(6) Zoning - Unknown

(7) Impervious core - Unknown

(8) Cutoff - Unknown

(9) Grout curtain - Unknown

h. Diversion and Regulating Tunnel - Not applicable

i. Spillway (Main)

(1) Type - Rubble masonry gravity structure

(2) Length of weir - 47 ft.

(3) Crest elevation - 515.0

(4) Gates - None

(5) U/S Channel - Pond

(6) D/S Channel - Plunge pool in bedrock just below spillway, then ledge floor channel with rubble masonry walls

j. Regulating Outlets

(1) Invert - Downstream 507, approximate, Upstream - unknown

(2) Size - 10 in. dia.

(3) Description - Steel pipe

(4) Control mechanism - Hand operated gate, not operational

(8) Top of dam - 517.0

(9) Test flood surcharge - 518.4 just upstream of dam
527.5 upstream of Route 20

(10) Route 20 roadway - 528.5

d. Reservoir (length in feet)

(1) Normal pool - 6,700

(2) Flood control pool - Not applicable

(3) Spillway crest pool - 6,700

(4) Top of dam - 7,500

(5) Test flood pool - 8,000

e. Storage (acre-ft.)

(1) Normal pool - 170

(2) Flood control pool - Not applicable

(3) Spillway crest pool - 170

(4) Top of dam - 282

(5) Test flood pool - 1,960

f. Reservoir Surface (acres)

(1) Normal pool - 37

(2) Flood-control pool - Not applicable

(3) Spillway crest - 37

(4) Top of dam - 72

(5) Test flood pool - 225

g. Dam

(1) Type - Stone wall with upstream earth embankment

(2) Length - 141

(3) Height - 12.5 ft.

(4) Top width - Varies, 16 ft. average

(5) Side slopes - Downstream: vertical wall
Upstream: undetermined

b. Discharge at Damsite

(1) Outlet Works Conduit. There is no operative low level outlet at the dam. There is a 10 in. dia. steel pipe passing through the face of the spillway which was discharging water into the spillway outlet channel at the time of the inspection. A stem leading to the control valve on the pipe was located but is reported not be be in working condition. The downstream invert of the outlet pipe is at approximate elevation 507. The upstream invert elevation is unknown. It is estimated the discharge capability of this pipe would be about 9 CFS if the control valve was wide open and the water surface level in the pond was at the top of dam.

(2) Maximum Known Flood at Damsite. No records are available of flood inflows into Pondville Pond, nor of spillway releases and surcharge heads during such inflows.

(3) Ungated Spillway Capacity at Top of Dam. The ungated spillway capacity at top of dam, elevation 517.0 is 425 CFS.

(4) Ungated Spillway Capacity at Test Flood Elevation. The ungated spillway capacity is 910 CFS at test flood elevation 518.4.

(5) Gated Spillway Capacity at Normal Pool Elevation. Not applicable

(6) Gated Spillway Capacity at Test Flood Elevation. Not applicable

(7) Total Spillway Capacity at Test Flood Elevation. The total spillway discharge at the test flood elevation is the same as (4) above, 910 cfs at test flood elevation 518.4.

(8) Total Project Discharge at Top of Dam. The total project discharge at top of dam is about 425 cfs at elevation 517.0.

(9) Total Project Discharge at Test Flood Elevation. The total project discharge at test flood is 1,500 cfs at elevation 518.4

c. Elevation. (ft. N.G.V.D.) - Assumed from U.S.G.S. map

(1) Streambed at toe of dam - 504.5

(2) Bottom of cutoff - Unknown

(3) Maximum tailwater - Unknown

(4) Normal pool - 515.0

(5) Full flood control pool - Not applicable

(6) Spillway crest - 515.0

(7) Design surcharge (Original Design) - Unknown

Guidelines for Safety Inspection of Dams, Pondville Pond has been classified as having a significant hazard potential.

e. Ownership. Pondville Pond Dam is owned by the Town of Auburn, 104 Central St. Auburn Massachusetts 01501. Telephone: 617-832-3761. Records on file at the Massachusetts Department of Public Works indicate the dam was owned by the Pondville Woolen Mills in 1942, and also by La Rec Fabric Mills Inc. in 1942 and the American Steel & Wire co. in 1925.

f. Operator. Mr. Donald LaVigne, Superintendent of Highways, Town of Auburn, Auburn, Massachusetts 01501. Telephone: 617-832-2658.

g. Purpose of Dam. The dam impounds a pond used for recreational purposes. About 150 ft. upstream of the dam a highway embankment supporting U.S. Route 20 crosses Pondville Pond. The surface areas of the pond downstream and upstream of the embankment are about 1 acre and 45 acres, respectively. The pond area upstream of the embankment is used for recreational purposes by property owners along the shore line.

Inspection of the site and records on file indicate the original intent of the dam was to impound water for the needs of a mill located at the dam site.

h. Design and Construction History. It is not known by whom the dam was designed or constructed. It is believed the dam was built in about 1875 to meet the water needs of a mill located at the dam site.

i. Normal Operating Procedures. No written operating procedures for the dam were disclosed. There are no operating devices at the dam which are in an operative condition. Three pipes were located which pass through the dam embankment. It is believed the three pipes served the mill that was located at the site, however, no controls were located for these conduits. A fourth pipe passes through the downstream face of the spillway. This pipe has a control located in it just upstream of the spillway, but it is not operative. No stoplogs or flash boards are used at the dam.

1.3 Pertinent Data

a. Drainage Area. The drainage area contributing to Pondville Pond encompasses a total of about 7.55 sq. mi. (4,832 acres), The surface area of Pondville Pond is 46 acres. The longest circuitous stream course leading to the dam is about 5.5 miles long with an elevation difference of about 185 ft., or at a slope of about 33 ft. per mile. The drainage area has a length of about 4.3 miles and has an average width of about 2 miles. Ramshorn Pond having a drainage area of 2.4 sq. mi. lies in the upper reaches of the drainage area and has a significant attenuating effect on the inflow to Pondville Pond. The drainage area contains both open fields and forested areas, but is predominately forested and has a scattered population. The topography of the drainage area is best described as rolling terrain. The drainage area rises from elevation 515 at normal pool to elevation 700.

Three pipes protrude from the downstream wall. Two of the pipes are about 6 in. in diameter and the third pipe has a 3 ft. diameter. The pipes appear to have no usefull purpose at the present time, but probably served a function when the mill was operating. The left end of the earth embankment is retained by a rubble masonry wall which also serves as the right training wall of the spillway. The earth embankment projects downstream of the spillway about 14 ft. in this area for a distance of about 16 ft. along the crest length of the dam. There is no embankment section on the left side of the spillway as the spillway abuts to natural ground on the left side.

(2) Appurtenant Structures. The spillway for the facility is located on the left side of the dam adjacent to the left abutment. The spillway is a rubble masonry gravity structure which is founded on well exposed bedrock in the river channel. A plunge pool is formed by the bedrock just below the spillway. The plunge pool has a rim elevation about 7 ft. below the crest of the spillway and 3.5 ft. above the downstream streambed level. The crest length of the spillway is 47 ft. The spillway rubble masonry training walls rise 2 ft. above the spillway crest to top of dam and extend to the downstream side of the plunge pool.

There is a 10 in. dia. steel pipe which protrudes through the face of the spillway and rests on a ledge outcrop in the plunge pool. A stem which is believed to be part of the control mechanism for the pipe is located just upstream of the spillway. The control for the pipe is partially or fully open, the pipe is discharging water, and the control mechanism is inoperative. The invert elevation at the outlet end is about 3.5 ft. above the stream bed.

c. Size Classification. Pondville Pond Dam has a hydraulic height of about 12.5 ft. above downstream river level, and impounds a normal storage of about 170 acre-ft. to spillway crest level and a maximum of about 282 acre-ft. to top of dam. In accordance with the capacity criteria given in Recommended Guidelines for Safety Inspection of Dams, the project falls into the small category on the basis of capacity and is therefore classified accordingly. A small dam is one which has a height less than 25 ft. and a storage capacity greater than 50 ac-ft. but less than 1,000 ac.-ft.

d. Hazard Classification. A breach failure of Pondville Pond Dam would release water down Ramshorn Brook to the Massachusetts Turnpike located about 3,800 ft. downstream of the dam and thence through a highly developed area of Auburn for a distance of about 3,200 ft. It is estimated that a local roadway just below the dam will be flooded and other flooding having a damaging effect will take place in the highly developed area between the Mass. Turnpike and Auburn St. It is estimated four local roadways, a railroad, State Route 12, two houses, seven commercial buildings, and a Post Office Building will be flooded due to the breach. The depth of flooding is estimated to be 1 ft. or less; however, there is the potential for appreciable economic losses. It is estimated there will be no damage due to flooding for the spillway full conditions. In accordance with the Recommended

PHASE I INSPECTION REPORT

PONDVILLE POND DAM MA 00197

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the reponsibility of supervising the inspection of dams within the New England Region. Louis Berger & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Louis Berger & Associates, Inc. under a letter of 30 September 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0043 Job Change No. 1 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection.

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Pondville Pond Dam is located in Worcester County in the Town of Auburn in south-central Massachusetts. The pond is situated at the junction of Ramshorn Brook and Stone Brook and about 2 miles upstream of Kettle Brook. The dam is reached via U.S. Route 20 and is shown on U.S.G.S. Quadrangle Worcester South, Mass. with coordinates approximately at N 42° 11' 41", W 71° 49' 21".

b. Description of Dam and Appurtenances

(1) Description of Dam. Pondville Pond Dam is a 12.5 ft. high, 141 ft. long rubble masonry faced dam with an upstream earthfill. The rubble wall has unmortared joints and a vertical downstream face. At the right abutment the wall is continuous with an old foundation wall for a mill that once was located on the right abutment. The crest width of the embankment section varies, but averages about 16 ft. The upstream slope could not be determined.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The Pondville Pond Dam is in poor condition at the present time. There is a major void in the right rubble spillway training wall which shows signs of loss of embankment material and which is exhibiting seepage. This void in the wall is of a serious enough nature as to require the immediate attention of a registered professional engineer to conduct further studies as outlined in Section 7. There are several other items of a remedial nature which were observed during the field visit and which also will require treatment as outlined in Section 7.

6.2 Design and Construction Data

No definitive plans of the dam, spillway, and rubble masonry walls for the old mill building are available. Data on the physical characteristics of the embankment materials are lacking. Calculations pertaining to the stability of the rubble masonry walls are lacking.

6.3 Postconstruction Changes

There are no records of any postconstruction changes made to the dam or the spillway over the course of its history. However, it is evident that a former mill building existed to the right of the spillway. This building has been demolished and the foundation wall of the building remains as part of the dam.

6.4 Seismic Stability

The dam is in Seismic Zone No. 2 and, in accordance with recommended Phase I Guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. On the basis of the Phase I visual examination, Pondville Pond Dam is judged to be in poor physical condition. The deficiencies revealed that further investigations should be carried out and some remedial work is needed. The major concerns with the overall integrity of the dam are as follows:

(1) The spillway will only pass 28 percent of the routed test flood outflow.

(2) The lack of an operative low level outlet.

(3) The large void in the embankment adjacent to the right training wall of the spillway and the void in the spillway training wall.

(4) The presence of seepage through the void in the spillway training wall.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Urgency. The recommendations and remedial measures enumerated below should be implemented by the owner within one year after receipt of this Phase I Inspection Report except the investigations of the void at the left end of the embankment and the void at the toe of the right spillway training wall should be carried out upon receipt of this report.

7.2 Recommendations

It is recommended the owner, the Town of Auburn, should retain the services of a registered professional engineer experienced in the design of dams to make a thorough investigation of the following and if shown to be necessary, appropriate remedial works should be designed and constructed.

(1) Perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and means to increase project discharge capacity.

(2) Investigate the reasons for: the void and loss of embankment just right of the right training wall of the spillway; the void in the spillway training wall; and the seepage emitting

through the training wall void.

(3) Investigate the need for and means to provide adequate drawdown capability.

(4) Prepare a plan and supervise removal of large trees (greater than 4 in. dia.) including their root systems from the upstream side of the spillway and at the toe of the dam to a distance of 10 ft. from the face of the rubble wall.

(5) Investigate the structural adequacy of the rubble masonry walls.

(6) Investigate the need for riprap on the upstream slope of embankment.

(7) Investigate the need to permanently plug the three pipes on their upstream ends.

7.3 Remedial Measures

a. Operation and Maintenance Measures

(1) Remove small trees (less than 4 in. dia.) and brush growth including their root systems on the embankment and at the toe of the dam to a distance of 10 ft. from the face of the rubble wall.

(2) Monitor seepage issuing through the rubble masonry walls in the area of the old mill site and through the two leaking pipes protruding through the face of the dam to the right of the spillway on a six month basis to ascertain any changes in clarity or quanity of flow.

(3) Repair the training wall on the left side of the spillway.

(4) Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, locations of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation. The plan will also include round-the-clock monitoring of the project during periods of heavy precipitation.

(5) Institute proceedures for an annual technical inspection of the dam and its appurtenant structures.

(6) Implement a regular periodic maintenance program.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

Appendix A

Inspection Checklist

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Pondville Pond Dam
DATE 24 October 1980
OWNER Town of Auburn, MA
TIME 10:00 AM
WEATHER Sunny - 50 F
W.S. ELEV. 515 U.S. ____ DN.S.

INSPECTION PARTY

A/E REPRESENTATIVES	OWNER'S REPRESENTATIVES
1. Pasquale E. Corsetti	Donald LaVigne, Superintendent
2. Roger F. Berry	of Highways, Town of Auburn
3. Carl J. Hoffman	
4. William S. Zoino	
5.	

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydrologic	Roger F. Berry	LBA
2.	Hydraulics/Structures	Carl J. Hoffman	LBA
3.	Geotechnical	William S. Zoino	GZA
4.	General Features	Pasquale E. Corsetti	LBA
5.			
6.			
7.			
8.			
9.			
10.			

LBA - Louis Berger & Associates, Inc.
GZA - Goldberg-Zoino & Associates, Inc.

PERIODIC INSPECTION CHECKLIST

PROJECT Pondville Pond Dam DATE 24 October 1980

PROJECT FEATURE Embankment NAME W. S. Zoino

DISCIPLINE Geotechnical NAME

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	517
Current Pool Elevation	515
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	N/A
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Irregular
Horizontal Alignment	Irregular
Condition at Abutment and at Concrete Structures	Left abutment wall is deteriorated
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Vegetation on Slopes	Major problem - heavy tree growth
Sloughing or Erosion of Slopes or Abutments	Void at spillway right training wall
Rock Slop Protection - Riprap Failures	No riprap on upstream slope
Unusual Movement or Cracking at or near Toes	Washout of embankment right of spillway
Unusual Embankment or Downstream Seepage	Seepage through void, right of spillway
Piping or Boils	Embankment washout, right of spillway
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECKLIST

PROJECT Pondville Pond Dam DATE 24 October 1980

PROJECT FEATURE Low Level outlet NAME

DISCIPLINE Hydraulics/Structures NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	N/A
Rust or Staining on Concrete	N/A
Spalling	N/A
Erosion or Cavitation	N/A
Cracking	N/A
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

Outlet works conduit is a 10 in. dia. steel pipe.

The pipe is full of holes and leaking water on downstream end.

The control mechanism is not in an operational condition and is in a part open or fully open position as the outlet pipe is discharging water.

Low level outlet discharges into spillway discharge channel.

PERIODIC INSPECTION CHECKLIST

PROJECT Pondville Pond Dam DATE 24 October 1980

PROJECT FEATURE Spillway NAME

DISCIPLINE Hydraulics/Structures NAME Carl J. Hoffman

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Yes, Brush and tree growth just upstream of spillway
Floor of Approach Channel	Unknown
b. Weir and Training Walls	
General Condition of Rubble Masonry	Poor
Rust or Staining	N/A
Spalling	N/A
Any Visible Reinforcing	N/A
Any Seepage or Efflorescence	Seepage through base of right trailing wall.
Drain Holes	None
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	Yes
Trees Overhanging Channel	Yes
Floor of Channel	Bedrock
Other Obstructions	Debris

Left training wall has collapsed.

Right training wall has void in it at base.

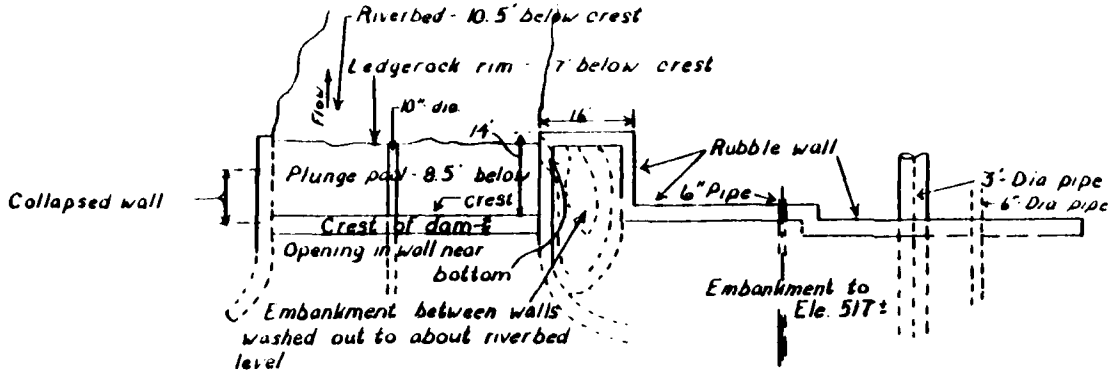
PERIODIC INSPECTION CHECKLIST

PROJECT: Pondville Pond Dam DATE: 24 October 1980

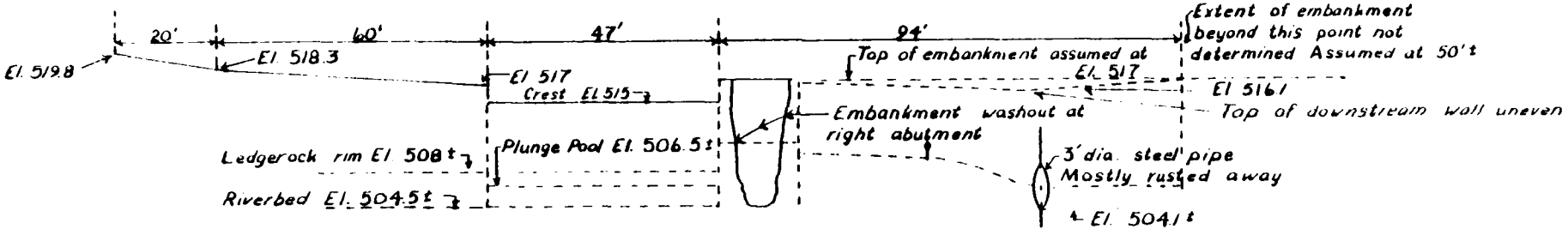
AREA EVALUATED	CONDITIONS
Dike Embankment	N/A
Outlet Works - Intake Channel and Intake Structure	N/A
Outlet Works - Outlet Structure and Outlet Channel	N/A
Outlet Works - Service Bridge	N/A

Appendix B

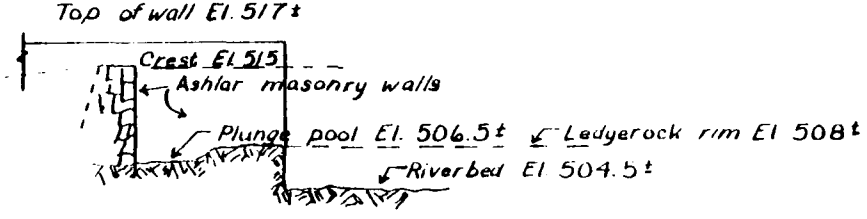
Engineering Data



PLAN



PROFILE ALONG AXIS DAM



SECTION THRU SPILLWAY

PONDVILLE DAM
PLAN AND PROFILE
B-1

3-14-17-4 11

1971
WINFIELD B. BLUM, Chairman
ALEX M. PAPPAS, Vice-Chairman
GERALD P. MURPHY
DONALD P. GARNACHE
EDGAR S. CAMPBELL

OFFICE OF THE
Board of Selectmen
P. O. BOX 33
AUBURN, MASSACHUSETTS 01501

March 7, 1972

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS
RECEIVED MAR 9 1972
Referred To J. Piaseczny
Report back to
File DAMS

March 3, 1972

Commonwealth of Massachusetts
Department of Public Works
Board of Selectmen
Town of Auburn
Auburn, Mass. 01501

Attn: Subject: PONDVILLE DAM #03-04, Di

Dear Sirs:

Reference is being made to your letter dated March 3, 1972 in regard to the building of a cone shaped dam in Pondville Pond at the entrance to the culvert on the easterly side of Route 20 in Auburn.

Please be advised that the Town of Auburn should write to:

Mr. Fred C. Schwelm, P. E.
Division of Waterways
100 Nashua St.
Boston, Mass.

requesting the aid of Chapter 91 Funds that might be available for building dams.

The Board in its inspe area holds the idea that the building of a cone shaped dam in Pondville Pond at the entrance to the culvert on the Easterly side of Route 20, the cost of building the same would not be excessive and such construction would bring decided improvement.

Very truly yours,

The Board believes that this might be a project to be presented to the Division of Waterways if not at this hearing, then possibly at a later hearing. The Annual Town Meeting of Auburn has been held and it would not be possible to have the Town on the Article required. The do ject might be investigated and that consideration might be given to the construction thus doing away with the Pondville Dam which appears to be insecure even though it is reported as safe. Your ideas as to the possibility in furthering this matter are solicited.

George E. Lybrand
District Highway Engineer
ART/rd
C - ART
F.C.Schwelm, P.E.

Yours very truly,
Auburn Board of Selectmen

Robert K. Daly
Executive Secretary

B-2

A Troiano
3-14-17-04

1971

WINFIELD B. BLUM, Chairman
ALEX M. PAPPAS, Vice-Chairman
GERALD P. MURPHY
DONALD P. GARNACHE
EDGAR S. CAMPBELL

OFFICE OF THE

Board of Selectmen

P. O. BOX 33
AUBURN, MASSACHUSETTS 01501

March 3, 1972

Commonwealth of Massachusetts
Department of Public Works
403 Belmont Street
Worcester, Massachusetts

Attention: Mr. George E. Lybrand, District Highway Engineer

Dear Sir:

The Auburn Board of Selectmen is in receipt of a report of the condition of the Pondville Dam No. 03-04 near Route 20 in Auburn. The Board has noted the items requiring attention at the dam and as soon as possible attempts will be made to undertake repairs. At best the dam presents a very poor appearance giving the idea that it is in dangerous condition requiring repairs or replacement. The dam holds but little water back of it comparatively but if it were removed for any cause the Pondville Pond would go out and would flow away as fast as the culvert under Route 20 would permit.

The Board in its inspection of the area holds the idea that the building of a cone shaped dam in Pondville Pond at the entrance to the culvert on the easterly side of Route 20 would relieve the situation considerably. Apparently, there would be no additional danger to the banking of Route 20, the cost of building the same would not be excessive and such construction would bring decided improvement.

The Board believes that this might be a project to be presented to the Division of Waterways if not at its meeting of April 6th then possibly at a later hearing. The Annual Town Meeting of Auburn has been held and it would not be possible to obtain the vote of the Town on the Article required. The Board in request that the project as described might be investigated and that consideration might be given to the idea of the construction thus doing away with the Pondville dam which appears to be insecure even though it is reported as sound. Your ideas as to the possibility in furthering this matter are requested.

Yours very truly,
Auburn Board of Selectmen

Hubert K. Barry
Executive Secretary

B-3

File

February 18, 1972

Winfield B. Blum, Chairman
Board of Selectmen
P. O. Box 33
Auburn, Massachusetts 01501

Re: Inspection of Dam #3-14-17-04
Auburn
Pondville Pond Dam

Dear Mr. Blum:

Reference is made to your letter dated January 28, 1972, wherein you request Department inspection of the above dam and information on possible funding assistance by State or Federal agencies.

The inspection, conducted on February 1, 1972, indicates that the dam appears structurally sound, but is badly in need of maintenance and repair.

As the owner of the dam, the Town has the responsibility of maintaining the structure in good condition so that it is, "sufficiently strong to resist the action of the water under any circumstances which may reasonably be expected to occur," as provided by Section 46 of Chapter 595, Acts of 1970.

In view of the Town's awareness of the hazards to property downstream and the dwindling flood storage capability of Auburn Pond, the following items require your prompt attention:

1. Remove heavy growth and trees from the dam.

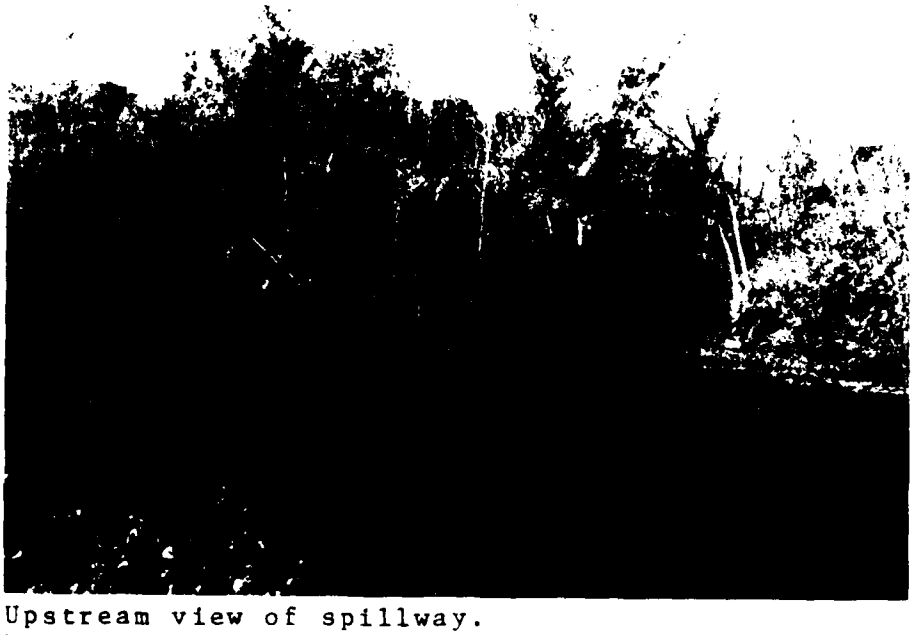
2. Remove tree (including root system) growing inside the spillway at the gate.

3. Repair or replace the inoperative 10 inch diameter outlet gate control structure.

4. Investigate and correct leakage problem at second 10 inch diameter pipe which apparently leads toward the location of the former mill.

5. The by-pass flume needs to be cleared of its blockage.

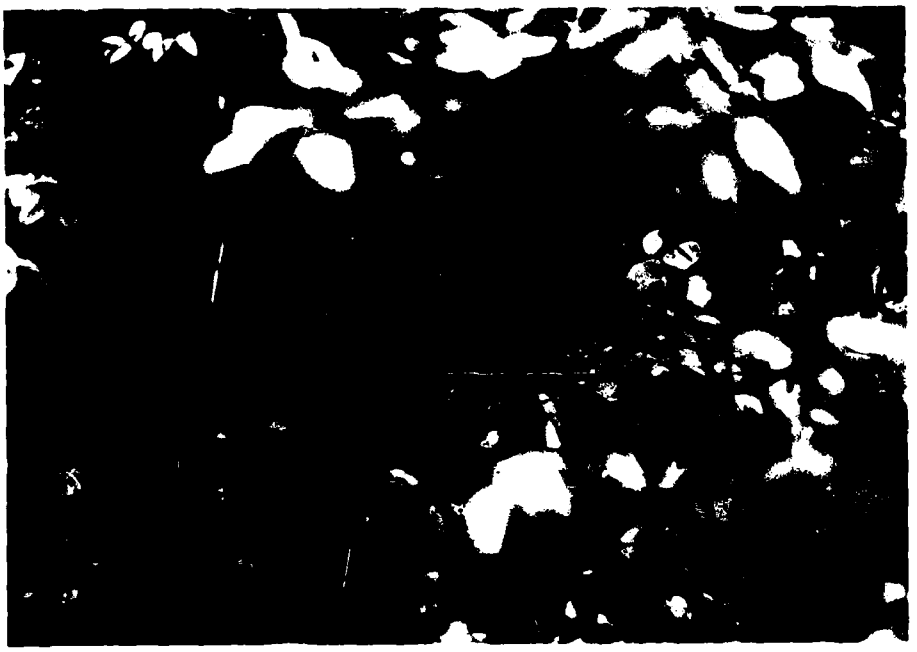
7. Downstream face of spillway from right spillway training wall.
Note: plunge pool and low level outlet.
(Photo taken 24 Oct. 1980)



8. Upstream view of spillway.
(Photo taken 24 Oct. 1980)

5. Void in upstream embankment at right spillway training wall. (Photo taken 2 March 1981)

6. Void at base of right spillway training wall. (Photo taken 24 October 1980)

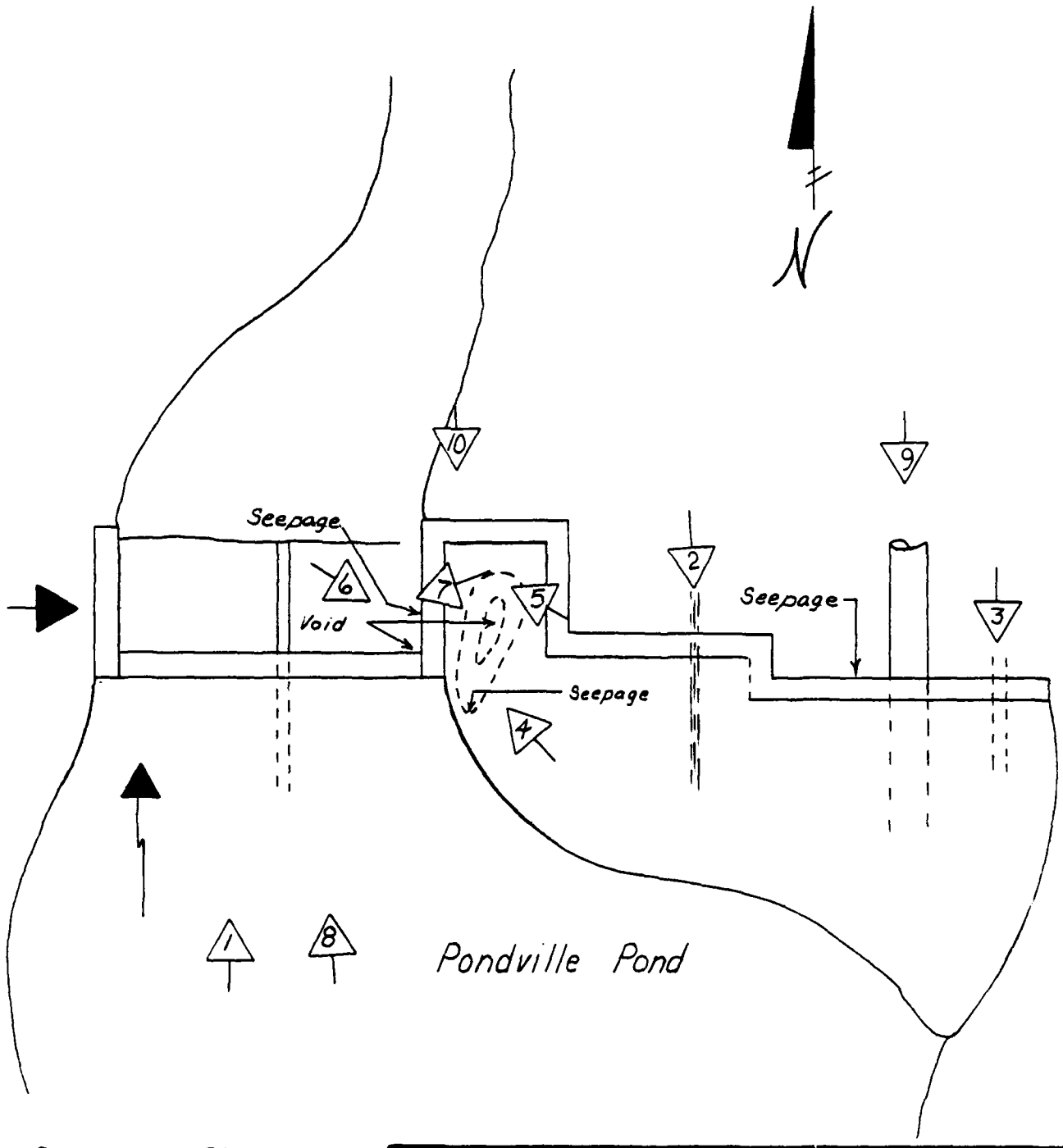


3. Downstream view of right 6 in. dia. pipe extending from downstream face of dam. (Photo taken 24 Oct. 1980)

4. Void in upstream embankment at right spillway training wall. (Photo taken 2 March 1981).

1. View of dam from Rt. 20 culvert. (Photo taken 24 Oct. 1980)

2. Downstream view of left 6 in. dia. pipe extending from downstream face of dam. (Photo taken 24 Oct. 1980)



Overview Photo

Appendix "C" Photo

LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PONDVILLE DAM

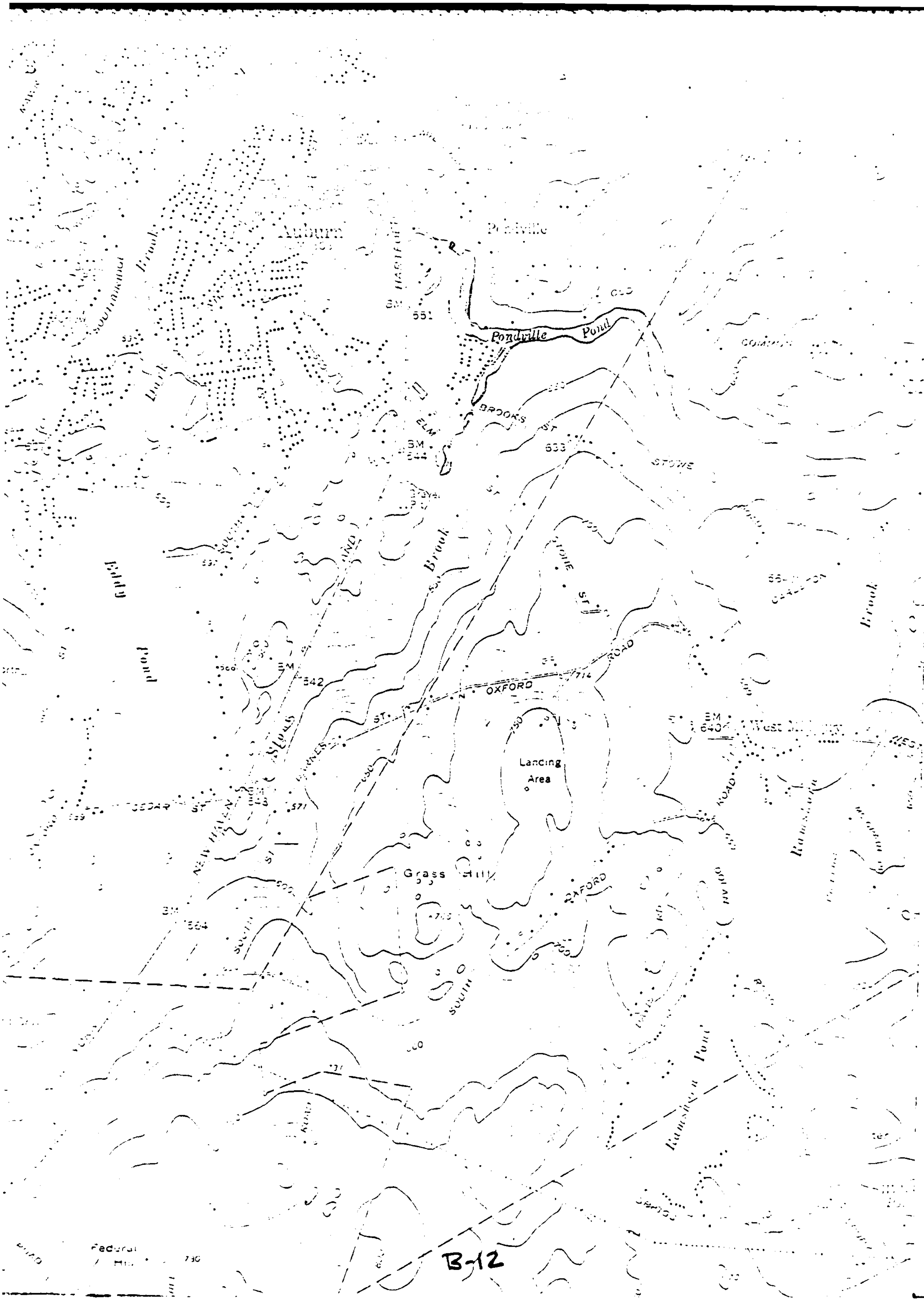
SKETCH PLAN SHOWING LOCATION & ORIENTATION OF PHOTOS

STATE - MA.

			SCALE NOT TO SCALE
			DATE

Appendix C

Photos


Auburn
Pondville
Pondville Pond
BM
551
BROOKS
ST
ELM
BM
544
STOWE
Brook
Eddy
Pond
STONE
ST
ROAD
N
OXFORD
ST
714
BM
542
BM
640
Landing
Area
Grass Hill
OXFORD
CEDAR
NEW HAVEN
BM
548
BM
564
SOUTH
Brook
Pond
Federal
Hill
730

B-12

OFFICE OF THE
Board of Selectmen
P. O. BOX 33
AUBURN, MASSACHUSETTS 01501

January 28, 1972

Worcester County Commissioners
Court House, Room 102
Worcester, Massachusetts

Gentlemen:

The Auburn Board of Selectmen has considered again the condition of the dam numbered 03-04 in the records of the Worcester County Commissioners and believes that it should be inspected as a matter of safety. Nothing has been done to repair it since September of 1969 when the matter was last reviewed. Should this dam go out for any reason the damage to property downstream might be considerable since Auburn Pond is much less in area than previously and there is not as much storage space for a flood.

The Board requests that the condition of this dam particularly be investigated and that if at all possible an opportunity be given to apply for federal or state assistance in payment for the renewal of it. May this matter receive your attention please.

Yours very truly,

Auburn Board of Selectmen
Winfield B. Blum, Chairman

Robert T. Barry
Executive Secretary

B-11

3-14-17-04

1971

WINFIELD B. BLUM, Chairman
ALEX M. PAPPAS, Vice-Chairman
GERALD P. MURPHY
DONALD P. GARNACHE
EDGAR S. CAMPBELL

OFFICE OF THE

Board of Selectmen

P. O. BOX 33
AUBURN, MASSACHUSETTS 01501

January 28, 1972

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS
RECEIVED JAN 31 1972
Referred to J. Piasecny
Report back to
File

Commonwealth of Massachusetts
Department of Public Works
Division of Waterways
Boston, Massachusetts

Attention: Mr. John T. Hannon, Deputy Chief Engineer

Dear Sir:

The Auburn Board of Selectmen desires to bring to your attention the necessity of an inspection of the Pondville Pond off Route 20 in Auburn.

A copy of a letter sent today to the Worcester County Commissioners is enclosed.

Yours very truly,

Auburn Board of Selectmen
Winfield B. Blum, Chairman

Hubert K. Barry
Executive Secretary

c.c. Dept. Public Works
403 Belmont Street
Worcester, Mass.

George E. Lybrand, District Highway Engineer

Note: Called Dist #3 Dams & Reservoirs Engr. this date 1-31-72 & P Romano had letter in hand and would have matter looked into.

LEO Andronica
1-31-72

B-10

CITY AUBURN NAME OF DAM "PONDVILLE" (M) PLAN NO. DAM NO. 11-5-04

ON Mill St. cor. Old Common Rd - "Pondville" Owned since 1945 by Worcester County Electric Co. C. C. DOCKET NO. 17

DESCRIPTION OF DAM

Masonry Spillway - Concrete cor. - Earth	
th	Abt 70±
ight	About 10'±
hickness top	At Spillway 30'±
" bottom	At spillway 40'±
Downstream Slope	" " vertical
Upstream "	½:1 ±
Length of Spillway	33'±
Size of Gates	prob. 24"
Location of Gates	Stem spillway & Spillway
Flashboards used	waste & Spillway - None
Width Flashboards or Gates	
Dam designed by	
" constructed by	
Year constructed	Prob. 1860±

GENERAL REMARKS

Was owned by Pondville Woolen Mills - N.Y. - 1942 La Rec Fabic Mills Inc.
Inspected July 1925 with Mr. C.E. Goodrich of the Am. Steel & Wire Co.
Inspected: Jan. 4, 1928 - Marden & Perry
" March 20, 1937 - K.M.F.
" Oct. 25, 1938 - " " "
Measured: March 24, 1939 - Corcoran - Casella.
See Note Book 134 - P. 15.

(OVER)

DESCRIPTION OF RESERVOIR & WATERSHED

Name of Main Stream	Ramshorn Brook.
" " any other Streams	
Length of Watershed	
Width " "	
Is Watershed Cultivated	
Percent in Forests	
Steepness of Slope	
Kind of Soil	Fdtn Ledge.
No. of Acres in Watershed	(7.51 Sq. M.)
" " " " Reservoir	13½ Acres.
Length of Reservoir	
Width " "	
Max Flow Cu. Ft. per Sec.	
Head or Flashboards-Low Water	
" " " -High	" Dam breach 1955 ?

GENERAL REMARKS

Inspected: Dec. 11, 1940. L.H. Spofford
" " 8, 1947 - L.O.N. - J.F.C.
" April 15, 1944 - " with W.C.E.Co.
" Jan. 17, 1945 - " "
" Sept. 3, 1947 - " "
" Nov. 8, 1948 - " "
" July 10, 1951, - " "
" Sept. 13, 1950. - " "
" " 15, 1954. - " "

Inspected: June 3, 1960 LON with W. C. E. Co - Geo. Lurne
" March 20. " " " " " "
" April 12, 1961 " " W.O.L. - Discussed with B A. Lucando - Asst to Supt
" July 20, 21 } " calls Dave Buckley - Geo. Camp
" " " L.O.M to see R.H. White of Construction re dam.

03-04
17

OWNER - TOWN OF AUBURN
104 CENTRAL ST.

INSPECTED - 12/15/71 - PACIELLO & NICHOLSON

Subject: Pondville Pond Dam - Auburn

Basically, the dam appears to be structurally sound, but ~~in~~ badly in need of maintenance and repairs.

If Federal Funds or State Assistance for payment of repairs is available, then this dam should be considered.

Enclosed please find a copy of the record for this dam.

Very truly yours,

George E. Lybrand
District Highway Engineer

ART/rd
C - ART
enc.

The Commonwealth of Massachusetts

Department of Public Works

DISTRICT #3 OFFICE
403 BELMONT STREET, WORCESTER 01604

February 7, 1972

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS
RECEIVED FEB 9 1972
Referred To: Piasecki
Report back to
File

D. S. Horgan, P. E.
Chief Engineer

Subject: POINDVILLE POND DAM
AUBURN

Attention Fred C. Schwelm, P. E.
Deputy Chief Engineer

Dear Sir:

Reference is being made to the letters from the Town of Auburn, one addressed to the Comm. of Mass., dated January 28, 1972, and one addressed to Worcester Commissioners, also dated January 28, 1972, in regard to the poor condition of Pondville Pond Dam, County Engineers' #03-04, now State's #3-14-17-04, and owned by the Town of Auburn.

On February 1, 1972, an inspection of the dam was made by Anthony R. Troiano, District 3 Dam & Reservoir Engineer, and his assistant, Peter Romano.

The investigation reveals the following:

1. The maintenance of the dam has been neglected.
2. There is a heavy growth of trees and shrubs on the dam and a large tree growing just inside the spillway at the gate.
3. An iron pipe outlet about 10 inches in diameter is flowing full and the gate which controls its flow appears to be inoperable.
4. Another outlet pipe about 10 inches in diameter which used to lead into an old mill that does not exist anymore, is leaking. The control of this pipe was not found, therefore it was unable to determine its condition.
5. A bypass flume was located, but this was blocked defeating its purpose.

INSPECTION REPORT & DATA FOR DAMS

Dam No.
Town:
Stream:
Pond:
Date:
By:

Owner:
His Address:
Function of Dam:

Location & Access:

USGS Quad. Lat. Long.
Drain.Ar.: Sq.Mi.; Ponds: ac.; Res.Dam:
Character of D.A.:

CONDITION RATING
Structural:
Hydraulic:
General:
PRIORITY:

Estimated Discharge Capacity:

General Description of Dam and Discharge Control:

Sketch (Not to Scale):

Remarks and Recommendations:

Date	By	Comment

Dam No.

3-14-17-4

February 16, 1972

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS

RECEIVED FEB 18 1972

Referred To J Piaseczny
Report back to
File

Mr. Winfield B. Blum, Chairman
Board of Selectmen
Auburn, Mass. 01501

Subject: Dam #03-04 Auburn

Dear Sir:

Reference is being made to your letter dated February 11, 1972 in regard to your request for an inspection of Dam #03-04 located in Pondville Pond near Route 20, and the possible opportunity to apply for Federal or State assistance in payment for the renewal of the dam.

Please be advised that an inspection has been made by the Worcester District Office and the report has been forwarded to the Boston Office for consideration.

As soon as the Boston Office completes its review of your request, you will be notified of the avenues available to you.

Very truly yours,

George E. Lybrand

George E. Lybrand
District Highway Engineer

ART/rd
C - ART
Fred C. Schwelm, P.E.
Deputy Chief Eng. Waterways

9. Downstream view of 3 ft. dia. pipe extending from downstream face of dam (Photo taken 2 March 1981).

10. Downstream view of right spillway training wall. (Photo taken 2 March 1981)

Appendix D

Hydrologic and Hydraulic Computations

BY R.F.B DATE 12-2-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF 2

CHKD. BY DATE PROJECT W-198

SUBJECT Pondville Dam Hydrology

FIND DRAINAGE AREA SCALE 1:25,000

READ #2 101.11 READ #3 149.66

" #1 52.64 " #2 101.11 AVE 48.51

48.47 48.55

AREA = 48.51 × 0.1556 = 7.55 SQ.MI

AREA OF POND SURFACE, (ELEV 515)

READ #2 45.64 READ #3 46.03

" #1 45.29 " #2 45.64 AVE 0.37

0.35 0.39

AREA = 0.37 (99.58) = 37 ACRES

AREA @ ELEV. 520

READ #2 11.77 READ #3 13.10 AVE 1.33

" #1 10.44 " #2 11.77

1.33 1.33

AREA = 1.33 (99.58) = 132 ACRES

AREA @ ELEV. 530

READ #2 13.36 READ #3 1597

" #1 10.76 " #2 13.36 AVE 2.605

2.60 2.61

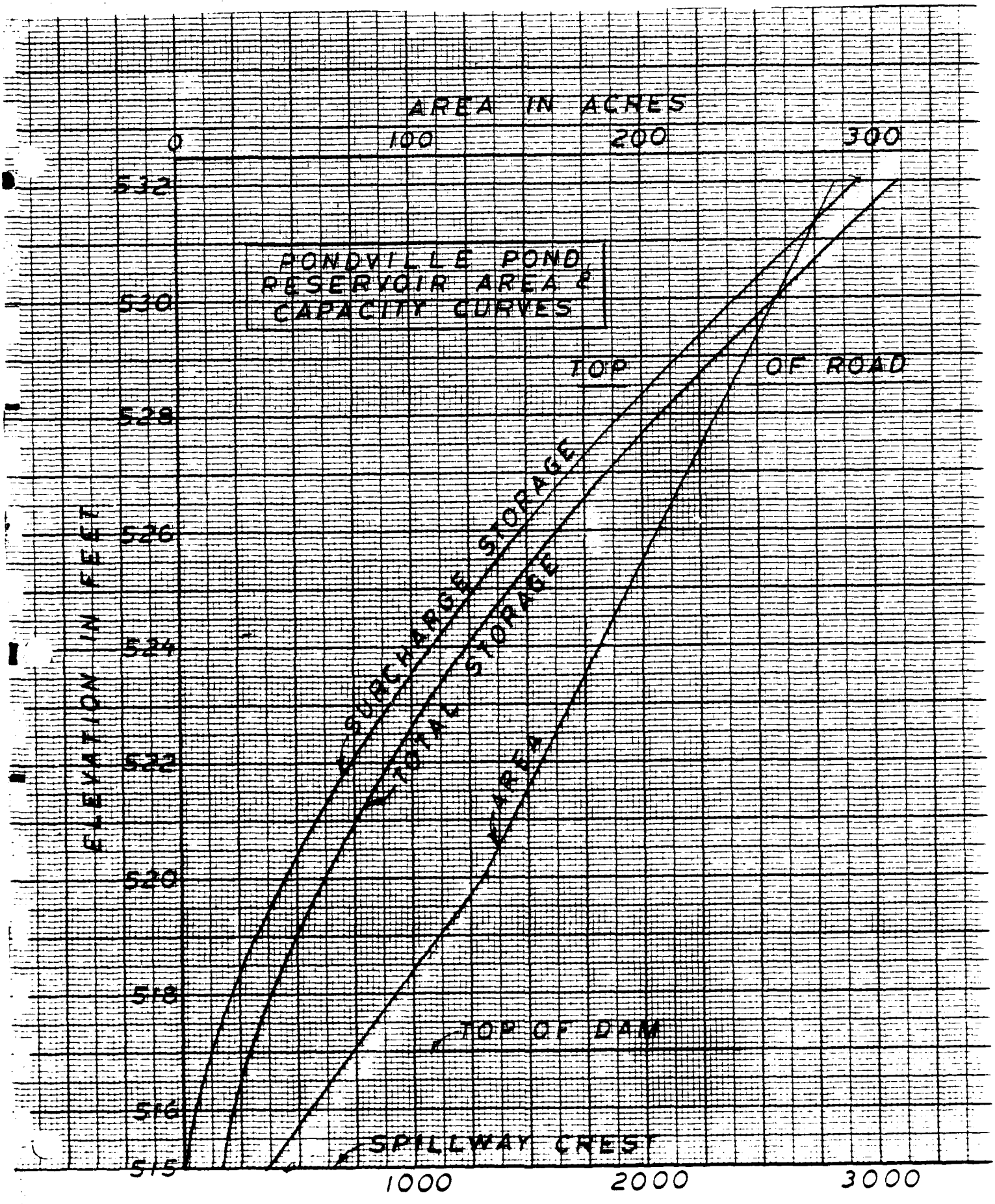
AREA = 2.605 (99.58) = 259 ACRES

SAY VOLUME @ SPILLWAY LEVEL:-

$\frac{5}{12}(515-504.1)(37.) = 168$ A.F.

SAY S = 170 ACRE-FT

ELEV.	AREA	AVE. AREA	Δ H	Δ STORAGE	TOTAL STORAGE	SURCHARGE STORAGE
515	37				170	
517	75	56	2	112	282	112
519	113	94	2	188	470	300
520	132	122.5	1	123	593	423
522	157	144.5	2	289	882	712
524	183	170	2	340	1222	1052
526	208	195.5	2	391	1613	1443
528	234	221	2	442	2055	1885
530	259	246.5	2	493	2548	2378
532	284	271.5	2	543	3091	2921

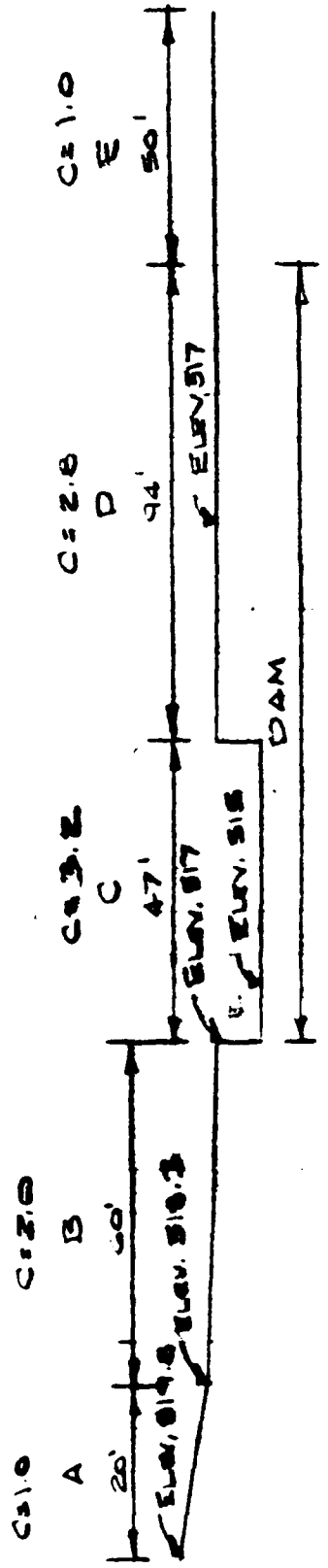

AREA IN ACRES
0
100
200
300
532
530
528
526
524
522
520
518
516
515
ELEVATION IN FEET
PONDVILLE POND
RESERVOIR AREA &
CAPACITY CURVES
TOP OF ROAD
SURCHARGE
SURCHARGE
SURCHARGE
SURCHARGE
TOP OF DAM
SPILLWAY CREST
1000
2000
3000
SURCHARGE & TOTAL STORAGE
IN ACRE-FEET

D-3

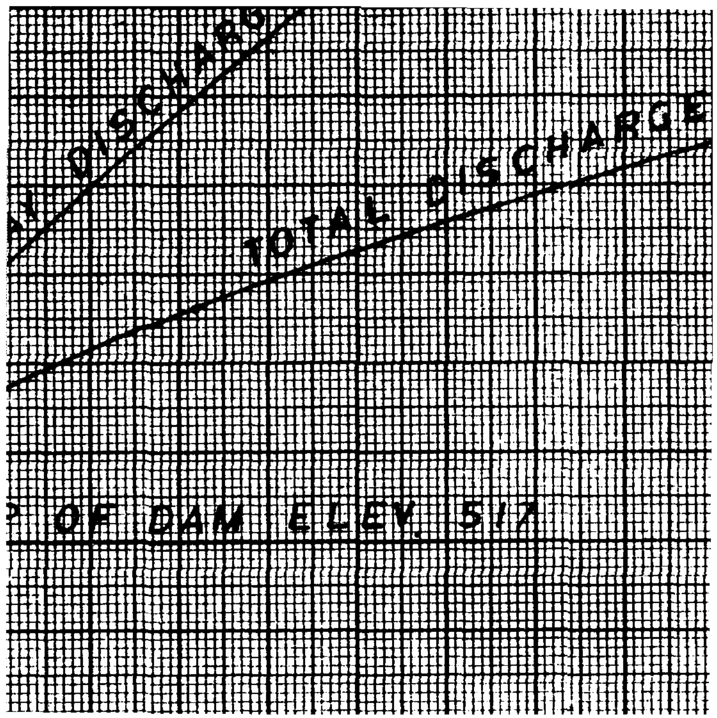
BY RFB DATE 12-3-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF 1

CHKD. BY ____ DATE ____ PROJECT W-198

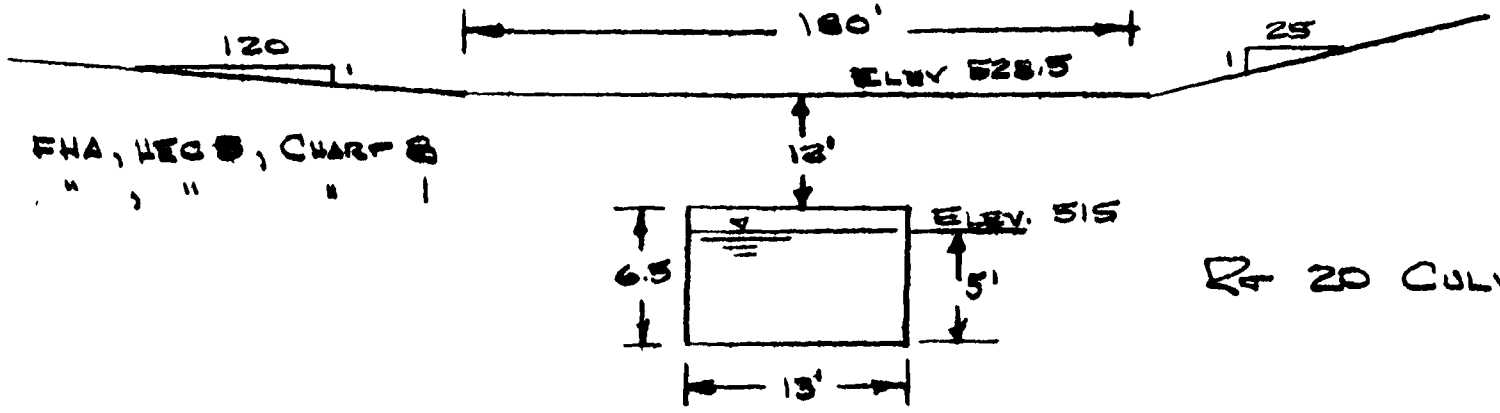
SUBJECT PONDVILLE DAM , DAM CAPACITY CURVE



ELEV. FT.	"A" L	"A" H	"A" G	"B" L	"B" H	"B" G	"C" H	"C" G	"D" H	"D" G	"E" H	"E" G	TOTAL G
515.5	0	0	0	0	0	0	.5	55	0	0	0	0	55
516	0	0	0	0	0	0	1	150	0	0	0	0	150
516.5	0	0	0	0	0	0	1.5	275	0	0	0	0	275
517	0	0	0	0	0	0	2	425	0	0	0	0	425
517.5	0	0	0	0	.25	6	2.5	594	.5	96	.5	18	730
518.3	0	0	0	0	.65	63	3.3	902	1.3	390	1.3	74	1430
519	0	.35	2	0	1.35	180	4	1203	2	744	2	141	2285
519.5	0	.75	13	0	2.15	378	4.8	1582	2.8	1233	2.8	234	3440
521	9	1.95	54	20 →	3.35	784	6	2210	4	2106	4	400	5500
522	20 →	2.95	101		4.35	1088	7	2785	5	2443	5	554	7475



AY DISCHARG
TOTAL DISCHARGE
P OF DAM ELEV. 517



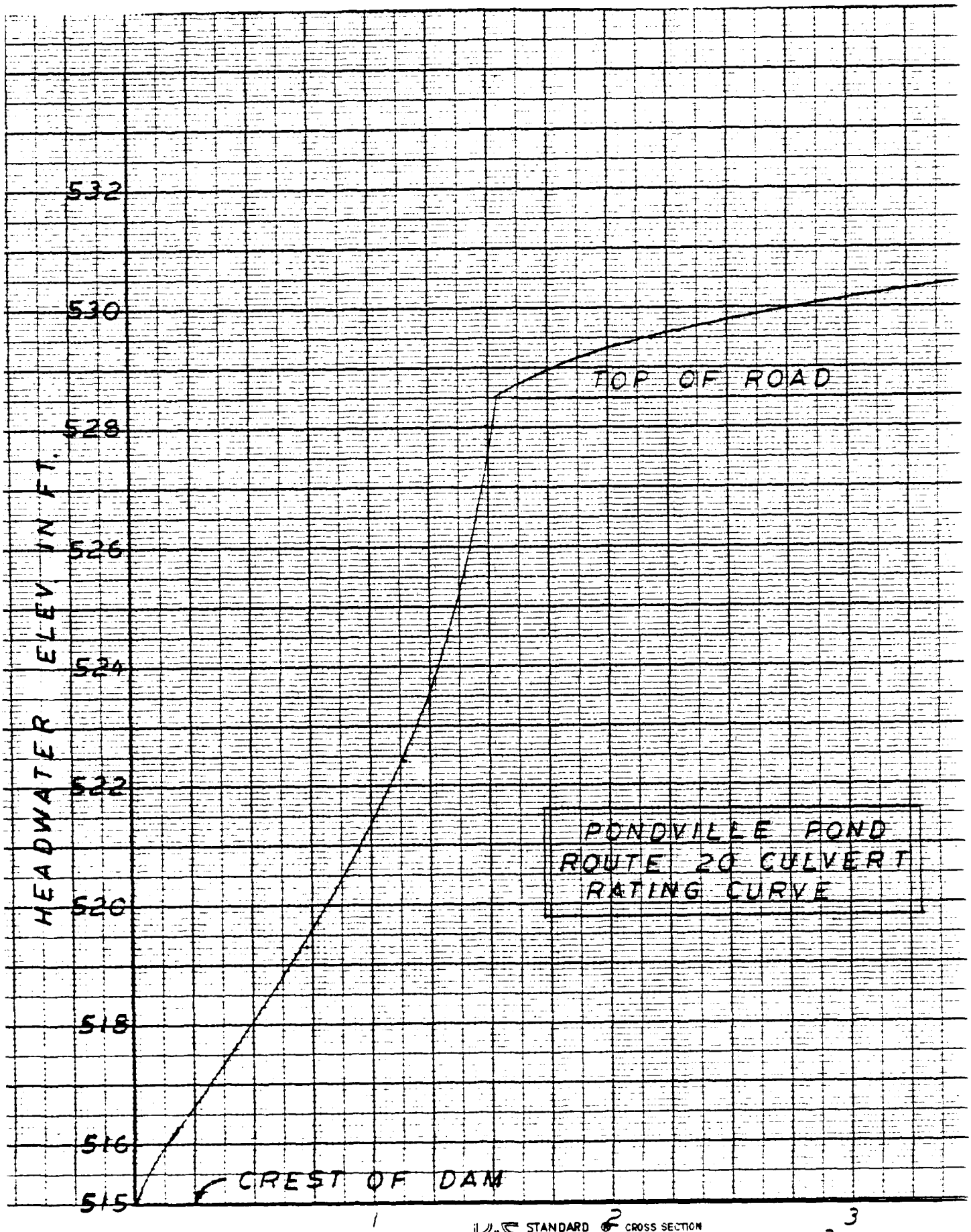
* FHA, HEC 5, CHART 5
** " , " " 1

Rt 20 CULVERT

Tail Water Elev.	Q over Dam	Culvert Outlet Control * ΔH	Culvert Outlet Control H.W. Elev	Culvert Inlet Control ** HW/D	Culvert Inlet Control H	Culvert Inlet Control HW Elev.	Type Control	Q thru Culvert
515	0							
516	150	0.1	516.1	0.42	2.7	512.7	Outlet	150
517	425	0.6	517.6	0.83	5.4	518.4	"	425
517.5	730	1.8	519.3	1.24	8.1	518.1	"	730
518	1130	4.4	522.4	1.90	12.4	522.4	I/O	1130
	1640	9.0	527.5	3.20	20.8	530.8	Inlet	1640
	1495			2.77	18.0	528.0	"	1495
	1534			2.85	18.5	528.5	"	1534
	2192			3.0	19.5	529.5	"	1586
	3643			3.16	20.5	530.5	"	1638
	5907			3.31	21.5	531.5	"	1690

D-6

Q over Roadway	Elev.	
	529.5	$Q = 2.8(180)(1)^{3/2} + 2.0(120)(.5)^{3/2} + 2.0(25)(.5)^{3/2} = 606$
	530.5	$Q = 2.8(180)(2)^{3/2} + 2.0(240)(1)^{3/2} + 2.0(50)(1)^{3/2} = 2005$
	531.5	$Q = 2.8(180)(3)^{3/2} + 2.0(360)(1.5)^{3/2} + 2.0(75)(1.5)^{3/2} = 4217$



K&E STANDARD CROSS SECTION
10 X 10 TO THE HALF INCH

BY RF3 DATE 12-1-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 1 OF 6

CHKD. BY _____ DATE _____ PROJECT W-198

SUBJECT POND 1 — DAM INFLOW HYDROGRAPH

FIRST ROUTE INFLOW FROM DRAINAGE AREA ABOVE RAMSHORN POND THROUGH RAMSHORN POND DAM

FIND D.A. ABOVE RAMSHORN POND

READ #2 36.37 READ #3 51.91
" #1 20.99 " #2 36.37
15.38 15.44 AVE 15.41

AREA = 15.41 × 0.1556 = 2.40 SQ. MI

FIND NORMAL AREA OF RAMSHORN POND (ELEV. 627)

READ #2 42.15 READ #3 43.35
" #1 40.92 " #2 42.15
1.23 1.20 AVE = 1.215

AREA = 1.215 × 99.58 = 121 ACRES

AREA @ ELEV. 630

READ #2 44.66 READ #3 46.09 AVE = 1.40
" #1 43.29 " #2 44.66
1.37 1.43

AREA = 1.40 × 99.58 = 139 ACRES

AREA @ ELEV. 640

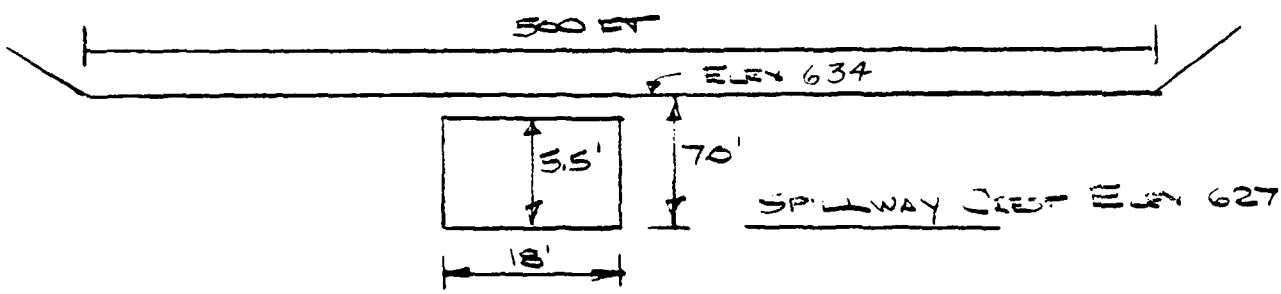
READ #2 24.18 READ #3 26.11
" #1 22.20 " #2 24.18
1.98 1.93 AVE = 1.96

AREA = 1.96 × 99.58 = 195 ACRES

F. SURCHARGE STORAGE (RAMSHORN POND)

ELEV	AREA	ΔH	AVE AREA	SURCHARGE VOLUME
627	121			
628.5	130	1.5	125.5	188
630	134	1.5	134.5	390
632	150.2	2	144.6	679
634	161.4	2	155.8	991
636	172.6	2	167	1324
638	183.8	2	178.2	1681
640	195	2	189.4	2060

COMPUTE DISCHARGE CURVE (RAMSHORN POND)



ELEV.	SPILLWAY				OVER ROAD				TOTAL
	H	C	L	Q	H	C	L	Q	Q
427	0	3.2	18	0	0	2.4	482	0	0
429	2			163	0			0	163
431	4			461	0			0	460
433	6			846	0			0	850
434	7			1067	0			0	1070
434.5	7.5			1183	.5			494	1680
435	8			1303	1			1348	2700
435.5	8.5			1427	1.5			2567	3990
436	9	↓	↓	1555	2	↓	↓	3953	5510

COMPUTE INFLOW HYDROGRAPH (RAMSHORN POND)

DRAINAGE AREA = 2.40

LENGTH LONGEST WATER COURSE, L = 10,500 FT = 1.99 MI

ELEV. DIFFERENCE: 700 − 627 = 73 FT.

$\therefore$ SLOPE = $\frac{73}{1.99}$ = 36.68 FT/MI ∴ $\sqrt{S}$ = 6.06

NOW $\left(\frac{L L_c}{\sqrt{S}}\right)^{.33} = \left(\frac{1.99 \times 1.99}{6.06 \times 2}\right) = 0.69$

LAG = $K\left(\frac{L L_c}{\sqrt{S}}\right)^{.33}$ = 0.33 K

ASSUME K = 5.0 HRS — REFER TO "CURVE B" MOUNTAINOUS REGION, MIXED TERRAIN, B OR REG.

LAG = 0.69 (5) = 3.45 HRS

$T_p = 0.41D + 0.82$ (LAG), WHERE D = 1.0 HRS

$T_p = 0.41(1) + 0.82(3.45) = 3.24$ HOURS

CHECK VELOCITY $\quad T_c = \frac{T_p - 0.5D}{0.6}$

$T_c = \frac{3.24 - 0.5}{0.6} = 4.57$ HRS

$V = \frac{10,500}{4.57(3600)} = 0.64$ O.K.

BY ZFB DATE 12-3-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 4 OF 6

CHKD. BY ____ DATE ____ PROJECT W-198

SUBJECT PONDVILLE DAM, INFLOW HYDROGRAPH

RANSOM ROAD

$T_2 = T_p + T_2 = 3.24 + 1.67(3.24) = 8.65$ HRS

$q_p = \frac{484(A)(Q)}{T_p}$ Q = RUNOFF IN INCHES

$q_p = \frac{484(2.4)(1)}{3.24} = 359$ CFS

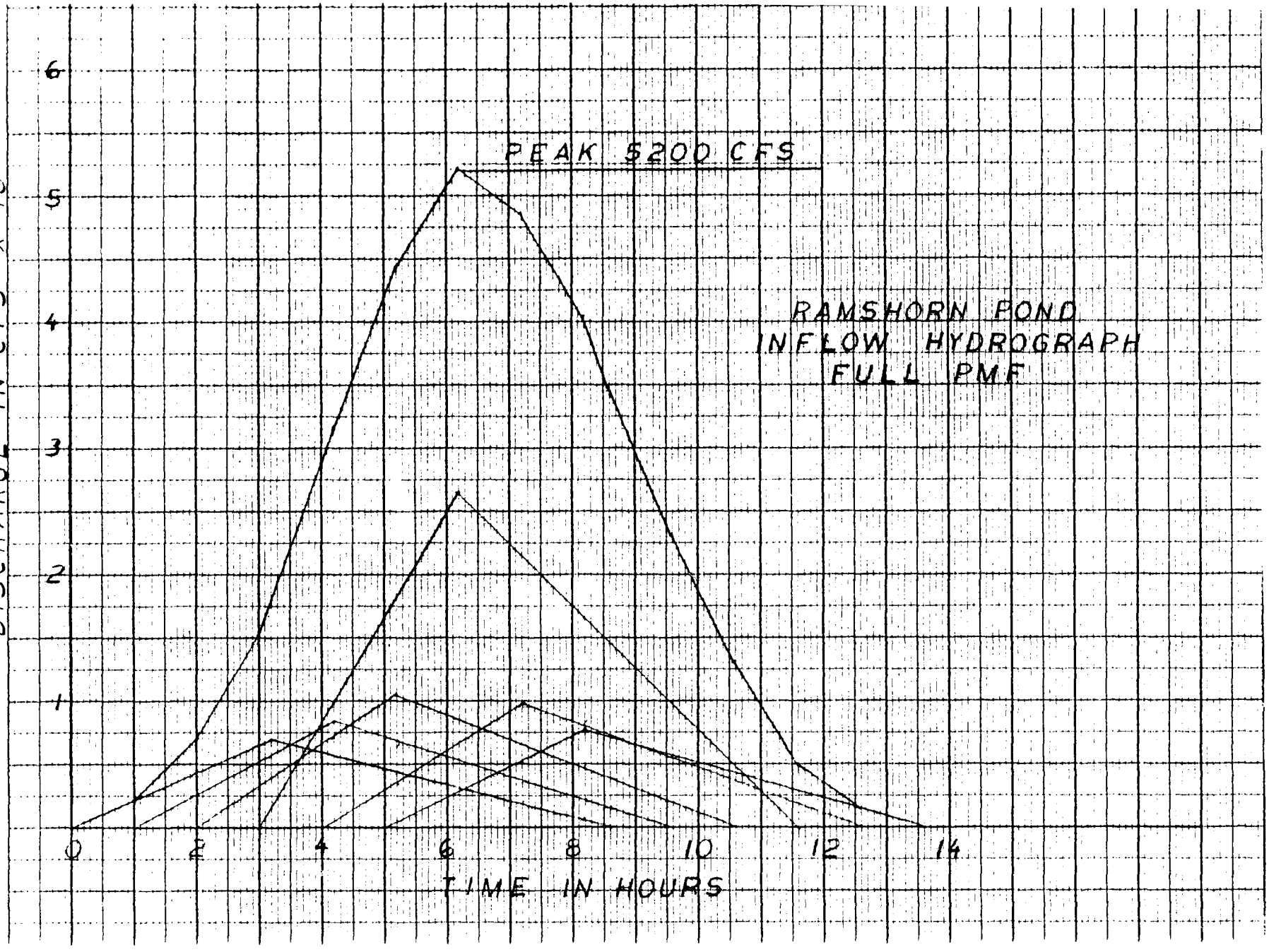
PMP = 25"(0.8) = 20" FOR AUBURN, MASS

= 19.4" CONSIDERING INFILTRATION FOR OVERLAND FLOW

FLOOD HYDROGRAPH FOR PMF $q_p = 359$

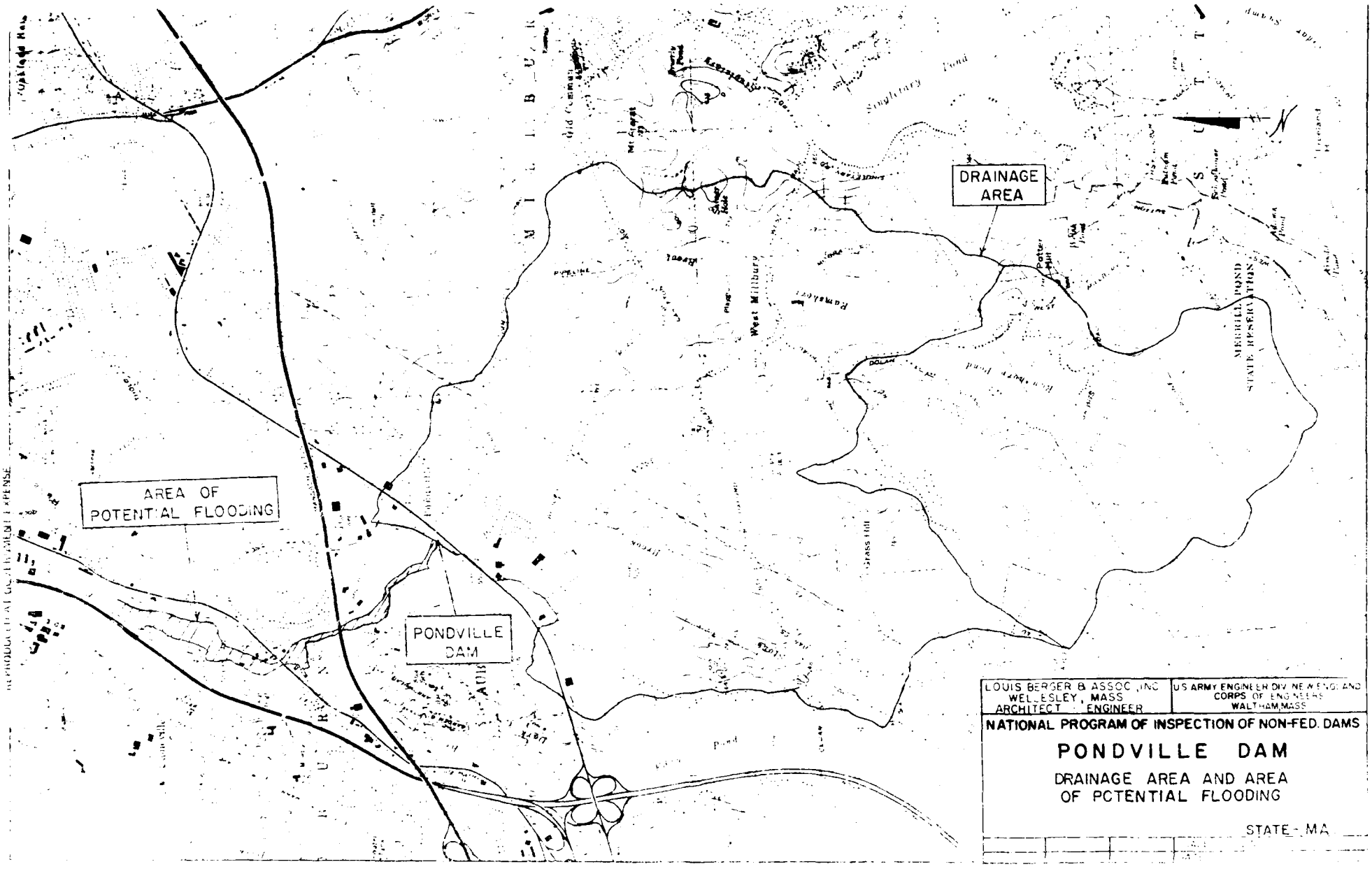
TIME (HOURS)	*%	INCHES	Q CFS	TIME BEGIN	TIME PEAK	TIME END
0.0						
1.0	10	1.94	696	0	3.2	8.6
2.0	12	2.33	836	1.0	4.2	9.6
3.0	15	2.91	1044	2.0	5.2	10.6
4.0	38	7.37	2645	3.0	6.2	11.6
5.0	14	2.72	976	4.0	7.2	12.6
6.0	11	2.13	764	5.0	8.2	13.6

* DISTRIBUTION OF MAXIMUM 6 HOUR PMP IN PERCENT OF 6 HOUR AMOUNT PER EM 1110-2-411

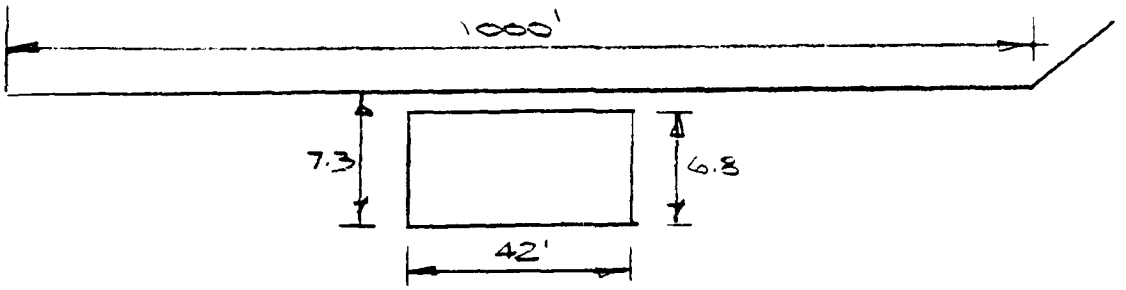

PEAK 5200 CFS
RAMSHORN POND
INFLOW HYDROGRAPH
FULL PMF
DISCHARGE IN CFS x 10³
TIME IN HOURS
0
2
4
6
8
10
12
14
1
2
3
4
5
6
KEUFFEL & ESSER CO.
MADE IN U.S.A.

Appendix E

Information as Contained in the National Inventory of Dams


DRAINAGE AREA
AREA OF POTENTIAL FLOODING
PONDVILLE DAM
West Millbury
MEDFIELD POND STATE RESERVATION
LOUIS BERGER & ASSOC., INC. WELLESLEY, MASS. ARCHITECT - ENGINEER
US ARMY ENGINEER DIV. NEW ENG. AND CORPS OF ENGINEERS WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
PONDVILLE DAM
DRAINAGE AREA AND AREA OF POTENTIAL FLOODING
STATE - MA

REACH #1: NO SIGNIFICANT STORAGE



AUBUEN ST.

ASSUME INLET CONTROL

H	HW/D	Q	C	L	H	Q	TOTAL Q
7.3	1.07	2100					
8.3	1.22	2566	1.5	1000	1	1500	4070
7.8	1.15	2310	1.5	1000	.5	530	2840

SAY FLOODING ABOUT 8" ACROSS AUBUEN ST.

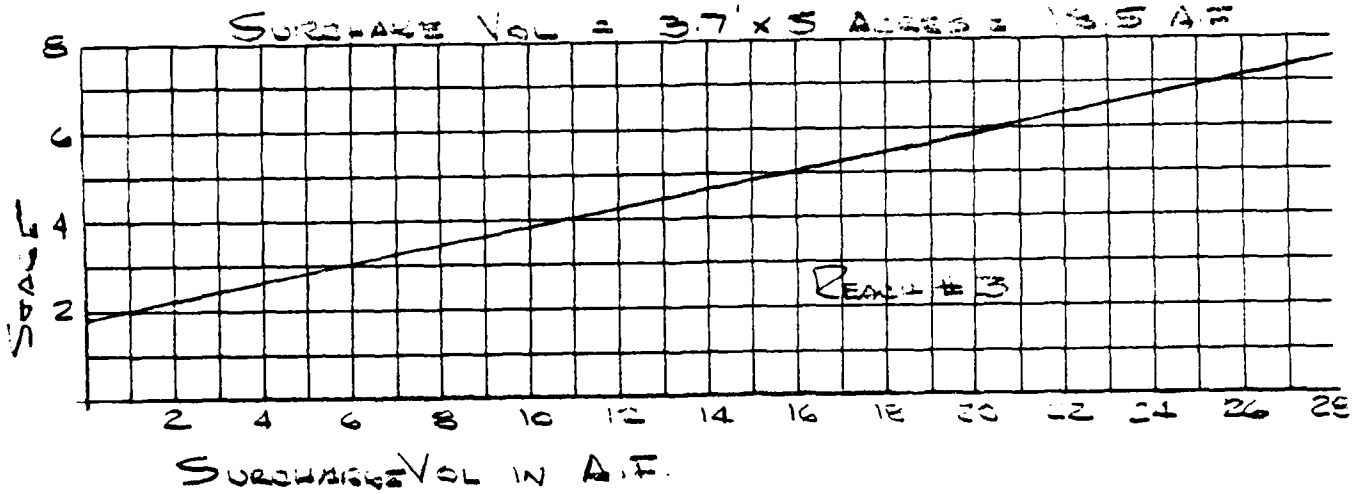
7 COMMERCIAL BLDS ? 8"
1 POST OFFICE BLDG ? 8"

COMPUTE SURCHARGE VOLUME 3RD RUN

SURCHARGE AREA = 5 ACRES

STAGE @ Q = 425 , ∴ 1.8 FT
" @ TOP DAM , ∴ 5.5 ΔH = 3.7

SURCHARGE VOL = 3.7' × 5 ACRES = 18.5 A.F.



FOR Q = 3,370, STAGE = 6.9, V_1 = 25

$$Q_{P_2}\text{ (TRIAL)} = 3{,}370\left(1 - \frac{25}{282}\right) = 3070$$

FOR Q = 3250, STAGE = 6.8, V_2 = 25 A.F.

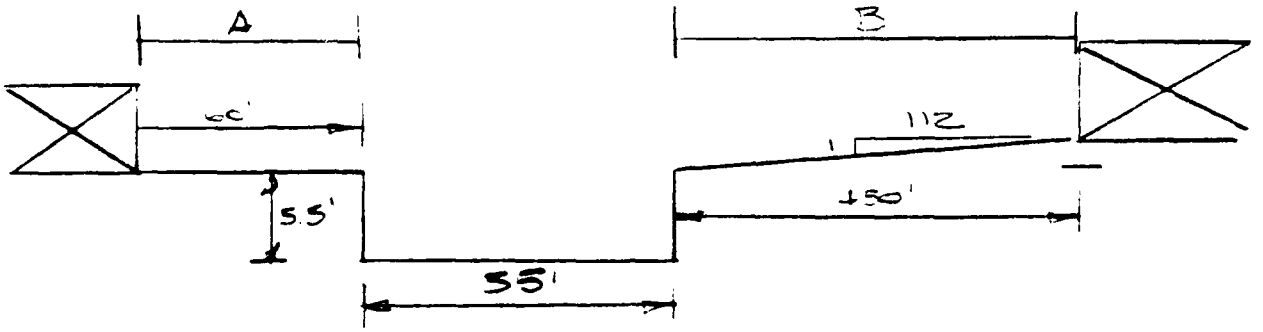
VOL = 25 A.F.

SAY Q = 3,070 STAGE 6.7,

DAM OVERTOPS BY 1.2 FT

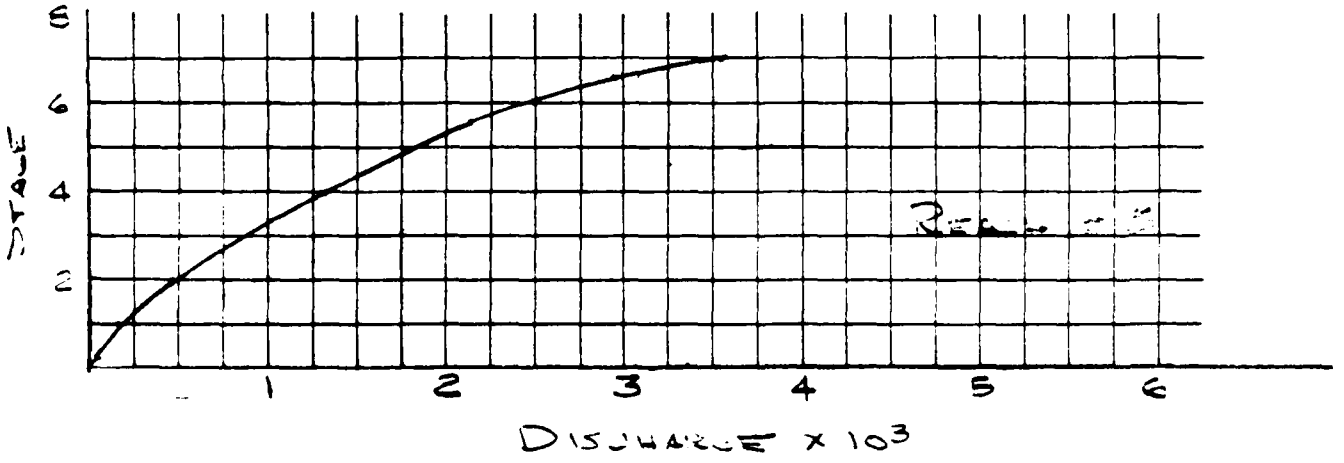
FLOODING OF 2 HOUSES, BASEMENT, 4 FT

REACH #3, MAIN PIKE TO DAM BELOW ARGENTINE



DAM BELOW ARGENTINE TO MAIN [illegible]

	SPILLWAY		A			B				
H	C	Q	H	C	Q	H	L	C	E	Q TOTAL
1	3.0	165	0	2.5	0	0		2.0		165
2		467	0		0	0				467
4		1320	0		0	0				1320
5.5		2128	0		0	0				2128
6		2424	.5		53	.25	66		.16	2493
6.5		2734	1		150	.5	112		.74	2952
7		3056	1.5		275	.75	178		2.1	3562

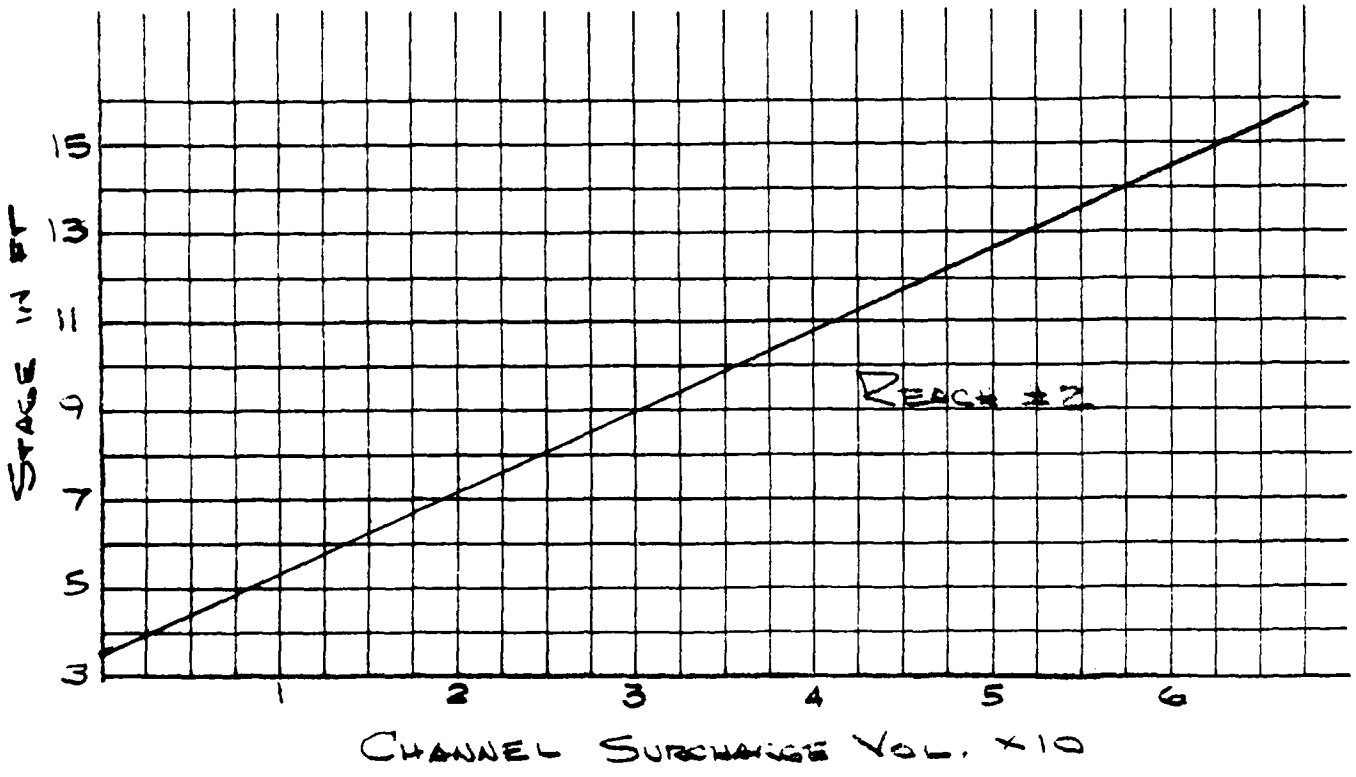


COMPUTE VOLUME REACH #2

AREA @ Q = 425, STAGE = 3.5, SURFACE AREA = 3 ACRES

AREA STAGE 13 FT, SURFACE AREA = 8.0 ACRES

SURCHARGE VOL. @ S = 13: $\frac{8+3}{2}(9.5) = 52$ A.F.



STEP 4, FOR Q = 4220, STAGE = 11.2, V_1 = 58

Q_{P-2} (TRIAL) = $4220\left(1 - \frac{58}{282}\right) = 3359$

FOR 3,400, STAGE = 13.7 FT, V_2 = 56, V_{AVE} = 57, A.F.

$Q_{P2} = 4220\left(1 - \frac{57}{282}\right) = 3370$

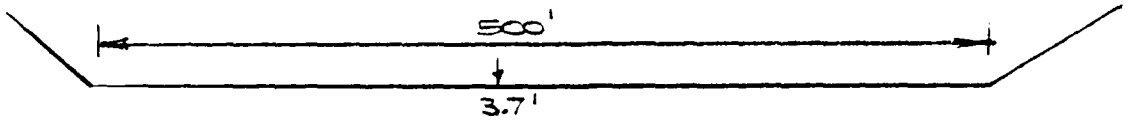
ROADWAYS UNDER MASS PIKE OVERTOPPED BY ABOUT 8 INCHES

BY RFB DATE 12-4-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 3 OF 7

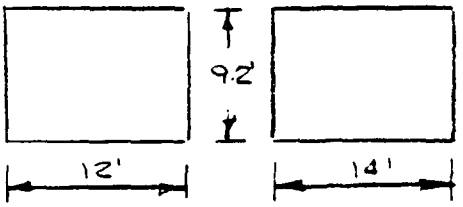
CHKD. BY ____ DATE ____ PROJECT ____

SUBJECT PENNSVILLE DAM DELAWARE RIVER

REACH #2, FROM CENTERLINE RT. MAIN DAM ~ 900 FT



* FHA NEC #5



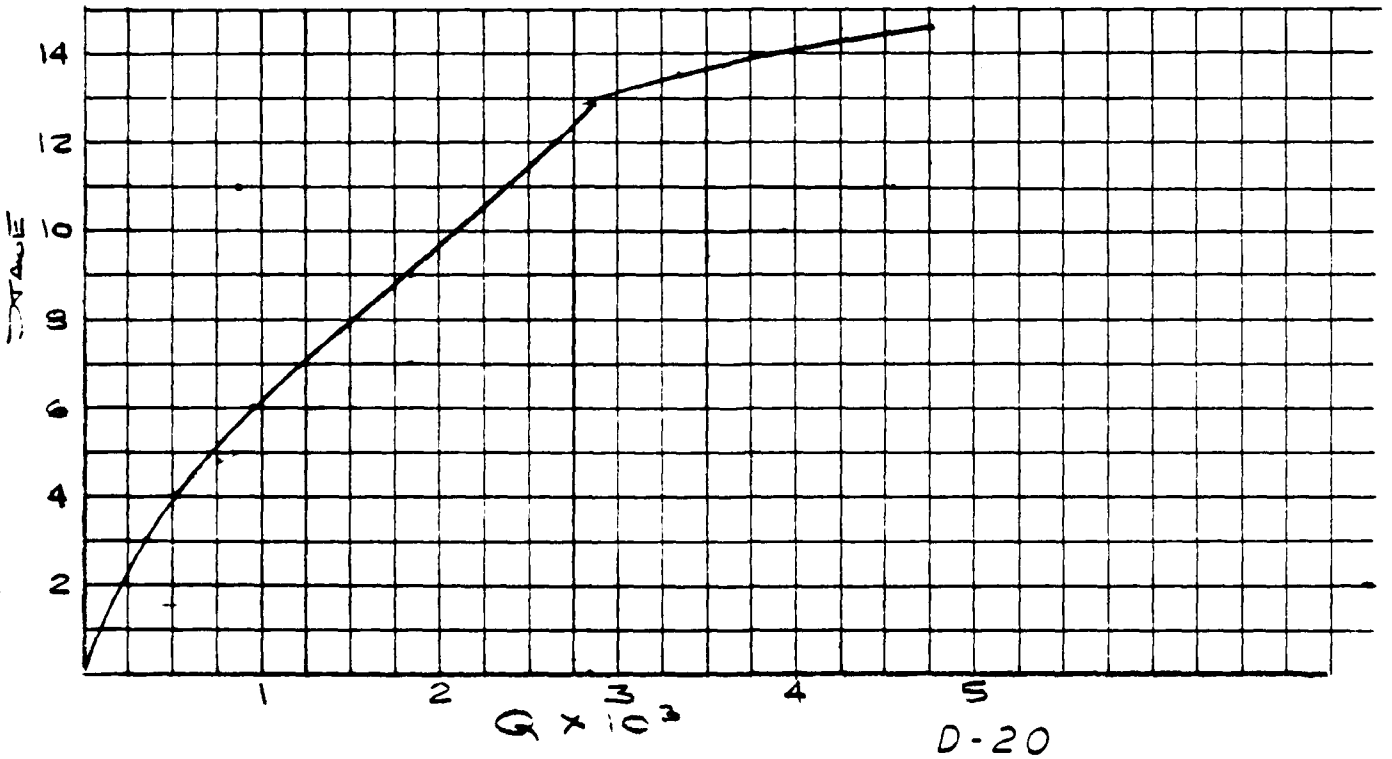
B = 26'

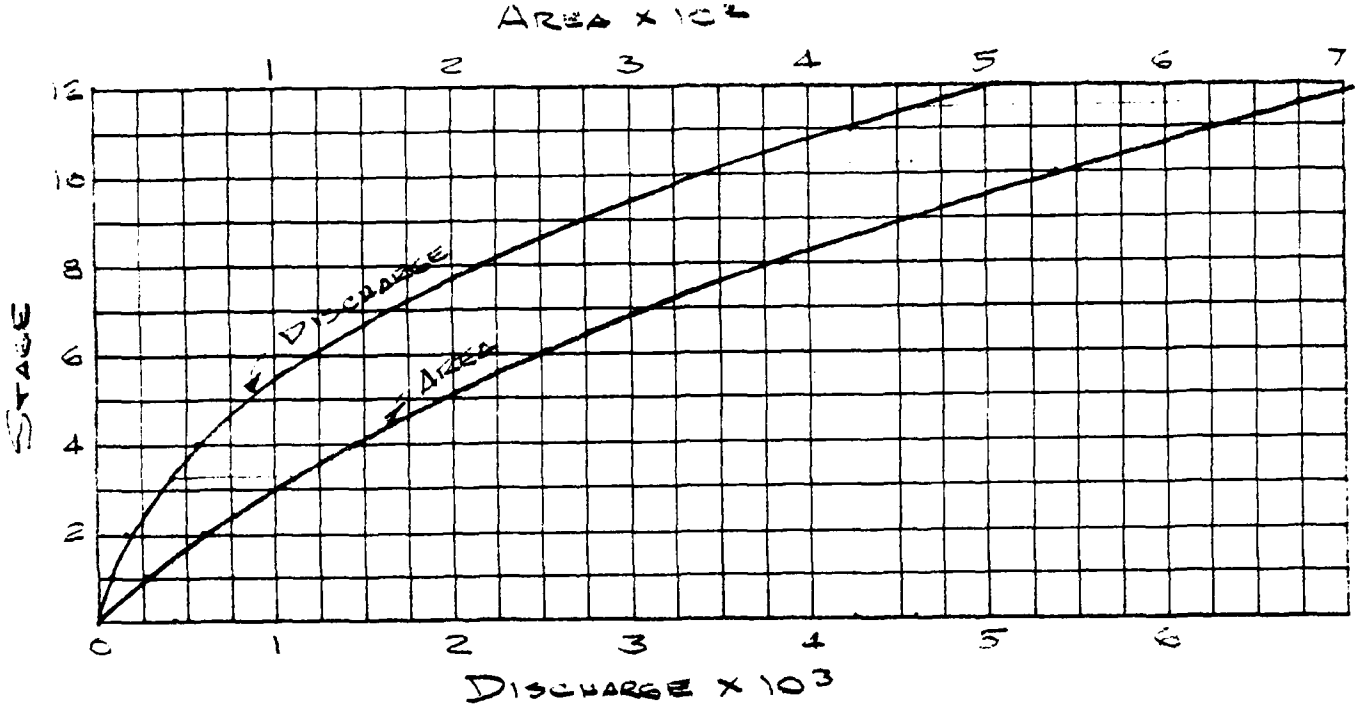
MASS PICE BOX CULVERTS (ASSUME INLET CONTROL)

HW	HW/D	* Q/B	Q
3	0.33	13	340
6	0.65	37	960
9	0.98	70	1820
12	1.30	102	2652
12.9	1.40	110	2860
13.5	1.47	115	2990
14.0	1.52	120	3120
14.5	1.58	125	3250

FOR STAGE DISCHARGE ONLY

OVER ROADWAY				Q
C	H	L	Q	TOTAL
1.5	0.6	500	350	3340
1.5	1.1	500	865	3985
1.5	1.6	500	1520	4770





FOR Q = 4,600 , STAGE = 11.4 , AREA = 675
" Q = 425 , " = 110
ΔA = 575

$$V_1 = \frac{575 \times 1900}{43{,}560} = 25 \text{ A.F.}$$

$$Q_{P2\,(TRIAL)} = 4{,}600\left(1 - \frac{25}{282}\right) = 4200$$

FOR Q = 4200 , STAGE = 11 FT , AREA = 625
ΔA = 515

$$V_2 = \frac{515 \times 1900}{43{,}560} = 22 \text{ A.F.}$$

$$V_{AVE} = \frac{25+22}{2} = 23.5$$

$$Q_{P2} = 4600\left(1 - \frac{23.5}{282}\right) = 4220$$

S = 282 A.F.
SPILLWAY Q = 425 CFS

FIND BREACH Q

LENGTH @ MID HEIGHT = 141 FT

FAILED LENGTH = W = 40% OF 141 = 56 FT
H = 517 − 504.1 = 12.9 FT

$Q_{P1} = 8/27\ W b \sqrt{g}\ Y_o^{3/2}$

$Q_{P1} = 1.68(56)(12.9)^{3/2} = 4360$

SAY $Q_{TOTAL} = 4360 + 0.6(425) = 4600$

REACH #1, DAM TO PENN CENTRAL RR, L = 1400 FT

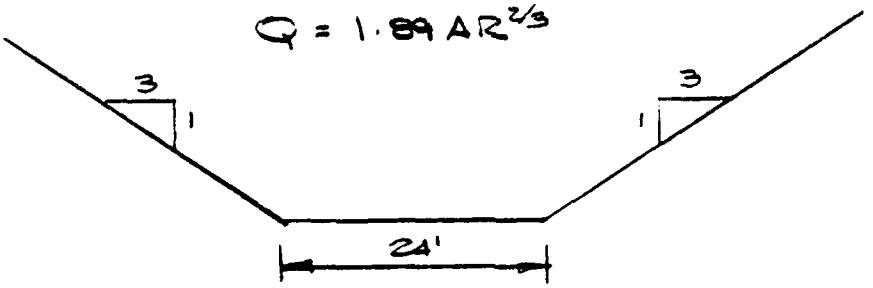
$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

$Q = 1.89\ A R^{2/3}$

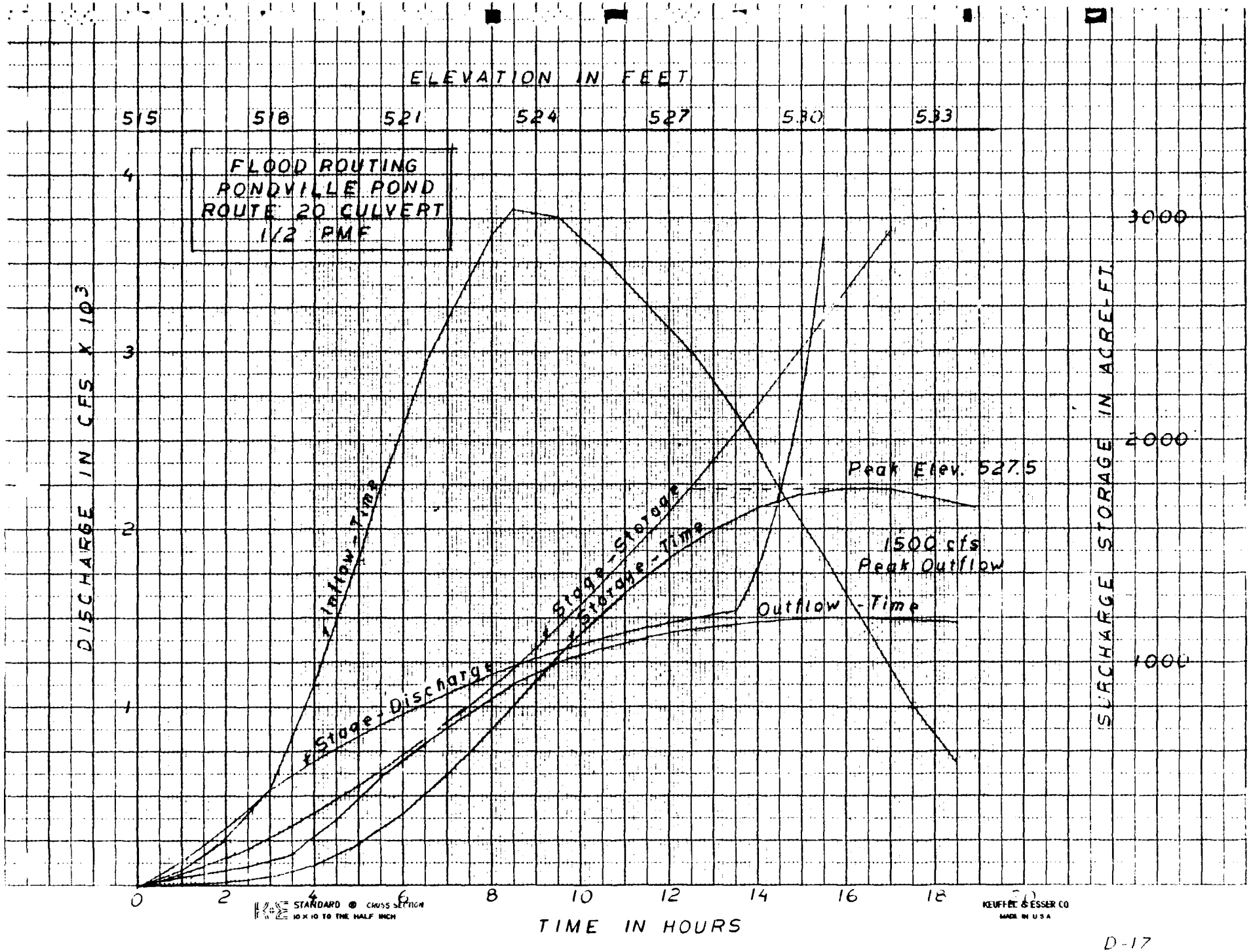
$S = \frac{5}{1400} = .0026$

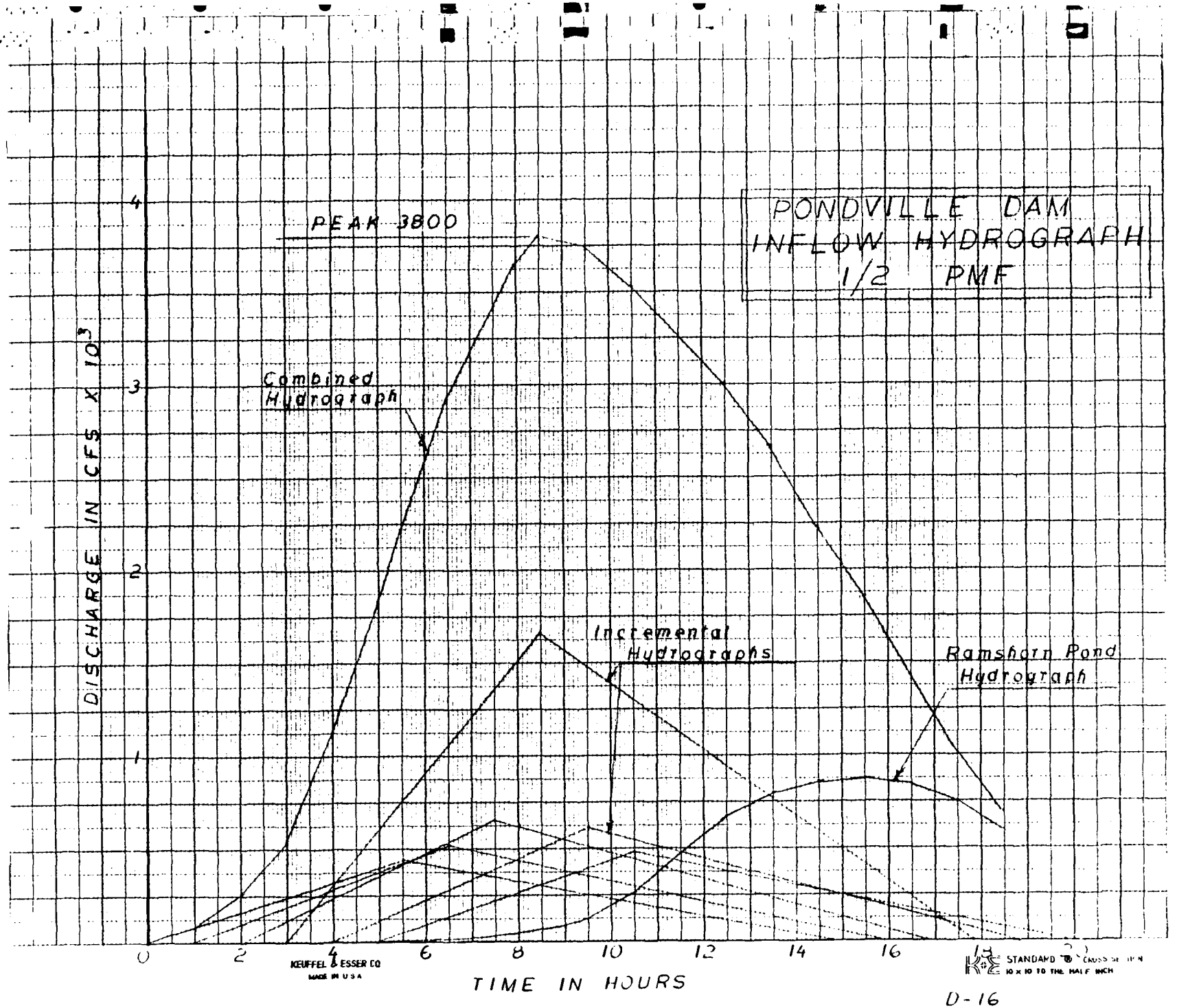
$S^{1/2} = .051$

$n = 0.040$



STAGE	AREA	P	$R^{2/3}$	Q
1	27	30.32	0.43	47
2	60	36.65	1.39	158
4	144	49.30	2.04	555
6	252	61.95	2.53	1205
8	384	74.60	2.96	2163
10	540	87.24	3.37	3434
11	627	93.57	3.56	4218
12	720	99.90	3.73	5075


ELEVATION IN FEET
515
518
521
524
527
530
533
FLOOD ROUTING
PONDVILLE POND
ROUTE 20 CULVERT
1/2 PMF
DISCHARGE IN CFS X 10³
STORAGE IN ACRE-FT.
3000
2000
1000
Peak Elev. 527.5
1500 cfs
Peak Outflow
Inflow - Time
Stage - Storage
Stage - Storage - Time
Outflow - Time
Stage - Discharge
0
2
4
6
8
10
12
14
16
18
TIME IN HOURS
STANDARD @ CROSS SECTION
10 X 10 TO THE HALF INCH
KEUFFEL & ESSER CO
MADE IN U.S.A.


PONDVILLE DAM
INFLOW HYDROGRAPH
1/2 PMF
PEAK 3800
Combined Hydrograph
Incremental Hydrographs
Ramshorn Pond Hydrograph
DISCHARGE IN CFS X 10³
TIME IN HOURS
0
2
4
6
8
10
12
14
16
1
2
3
4
KEUFFEL & ESSER CO
MADE IN U.S.A.

$T_3 = T_p + T_R = 5.54 + 1.67(5.54) = 14.8$ HRS

$q_p = \frac{484 A Q}{T_p}$, Q = RUNOFF IN INCHES

$q_p = \frac{484(5.15)(1)}{5.54} = 450$ CFS

FROM SHEET 4, PMP = 19.4 IN

FLOOD HYDROGRAPH FOR PMF, $q_p = 450$

TIME HOURS	%	INCHS	Q CFS	TIME BEGIN	TIME PEAK	TIME END
0.0						
1.0	10	1.94	673	0	5.5	14.5
2.0	12	2.33	1048	1.0	6.5	15.5
3.0	15	2.91	1310	2.0	7.5	16.5
4.0	38	7.37	3316	3.0	8.5	17.5
5.0	14	2.72	1224	4.0	9.5	18.5
6.0	11	2.13	958	5.0	10.5	19.5

ESTIMATE TRAVEL TIME FOR RANSOM FLOOD HYDROGRAPH TO REACH PENDVILLE POND, R+ 20. L = 18,480

SLOPE = $\frac{610.5 - 515}{18,480} = 0.005$

SAY VELOCITY = 1 FPS, TRAVEL TIME = $\frac{18,480}{1 \times 3600} = 5.13$ HRS

SAY T_+ = 5 HRS

BY CFB DATE 12-3-80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 5 OF 6

CHKD. BY ____ DATE ____ PROJECT W-195

SUBJECT PENDYLE DAM INFLOW HYDROGRAPH

COMPUTE INFLOW FROM BELOW RANSHOUSE POND

DRAINAGE AREA = 7.55 - 2.40 = 5.15 SQ MI

LENGTH LONGEST WATER COURSE = 21,840 = 4.14 MI

ELEV DIFFERENCE = 710 - 515 = 195 FT

$$\text{SLOPE} = \frac{195}{4.14} = 47.1 \text{ FT/MI} \quad \& \quad \sqrt{S} = 6.86$$

$$\text{Now } \left(\frac{L_c}{\sqrt{S}}\right)^{.33} = \left(\frac{4.14 \times 4.14}{6.86 \times 2}\right)^{.33} = 1.25$$

ASSUME K = 5.0 REFER TO "CURVE B" MOUNTAINOUS REGION, MIXED TERRAIN BOR-REC

$$\text{LAG} = K\left(\frac{L_c}{\sqrt{S}}\right)^{.33} = 5 \times 1.25 = 6.26 \text{ HRS}$$

$T_p = 0.41D + 0.62(\text{LAG})$, WHERE D = 1.0 HR

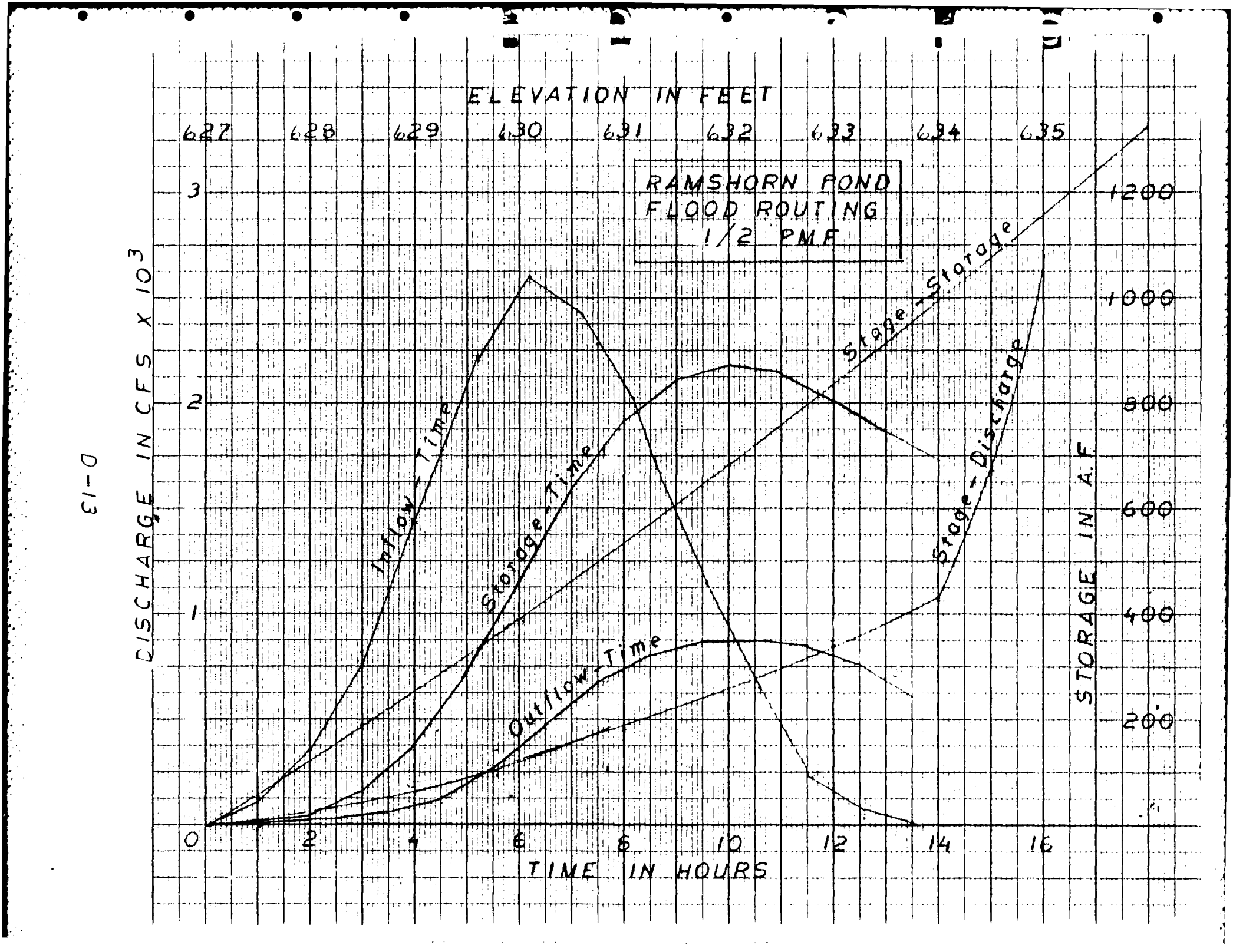
$T_p = 0.41(1) + 0.82(6.26)$

$T_p = 5.54$ HRS

CHECK VELOCITY $T_c = \dfrac{T_p - 0.5D}{0.6}$

$$T_c = \frac{5.54 - 0.5}{0.6} = 8.4 \text{ HRS}$$

$$V = \frac{21,840}{8.4(3600)} = 0.72 \text{ FT/SEC}$$


ELEVATION IN FEET
627
628
629
630
631
632
633
634
635
RAMSHORN POND
FLOOD ROUTING
1/2 PMF
DISCHARGE IN CFS X 10³
3
2
1
0
Inflow - Time
Storage - Time
Outflow - Time
Stage - Storage
Stage - Discharge
STORAGE IN A.F.
1200
1000
800
600
400
200
2
4
6
8
10
12
14
16
TIME IN HOURS

E1-0

END

FILMED

7-85

DTIC